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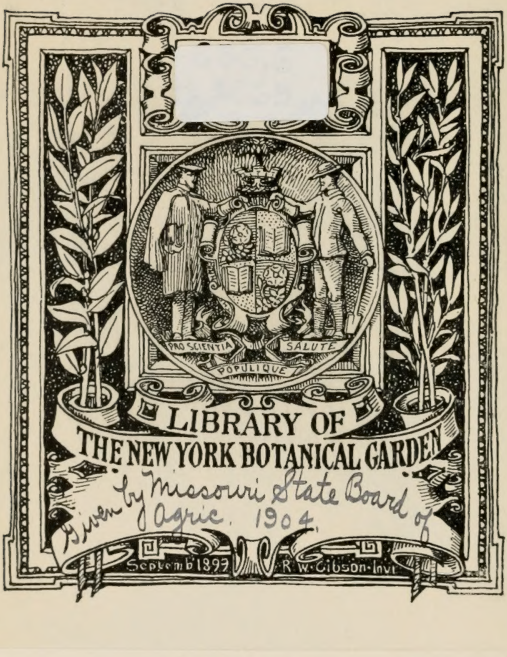
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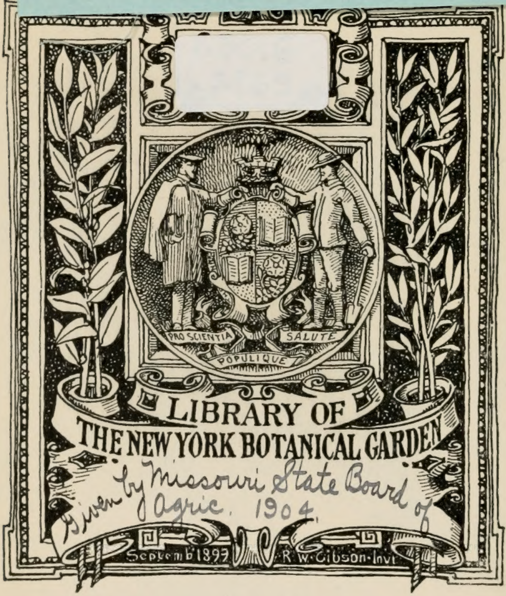
Missouri State Board of Agriculture.

Compliments of

Geo. B. Ellis,

Secretary.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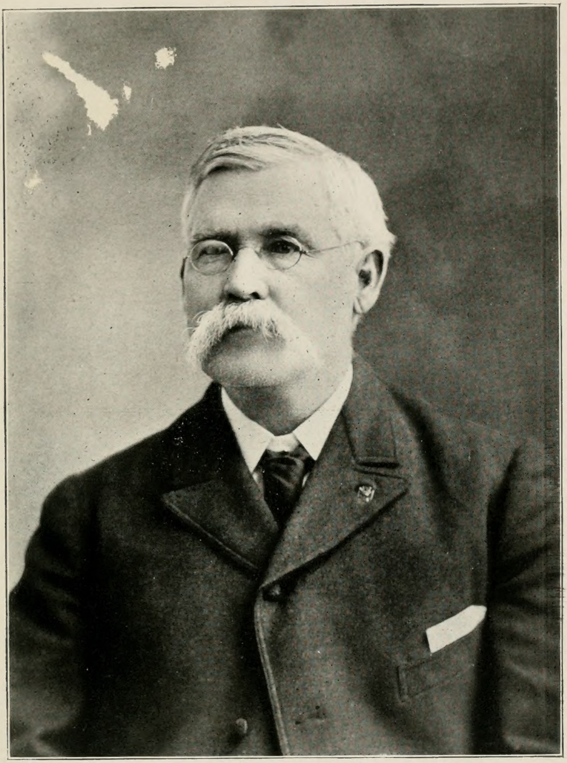

Hon. Ferd. J. Hess, Charleston, Mo., President State Board of Agriculture.

Institute Exhibit at Appleton City, 1902, Bates, Henry and St. Clair Counties.

THIRTY-FIFTH ANNUAL REPORT

OF THE

LIBRARY
NEW YORK
BOTANICAL
GARDEN

MISSOURI

STATE BOARD OF AGRICULTURE

CONTAINING A RECORD OF THE WORK FOR THE YEAR 1902.

PUBLISHED 1903.

JEFFERSON CITY, MO.:
Tribune Printing Company, State Printers and Binders.

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1902

LETTER OF TRANSMITTAL.

State Board of Agriculture, Office of Secretary,
Columbia, Missouri, February 12, 1903.

To the Hon. A. M. Dockery, Governor of Missouri:

Sir—I have the honor to transmit herewith a report of the work of the State Board of Agriculture for the past year.

We take great pride in recording the fact that the farmers of Missouri are putting into practice up-to-date scientific methods in their farm operations and that Missouri has taken first rank in the United States this year in the average yield per acre of corn, and has achieved second rank in the total amount produced of both corn and wheat. Missouri is not excelled by any country in the quality of her best herds and flocks.

The value of our farm lands has greatly advanced and at the advanced prices our lands afford as good opportunity for investment as the lands of any other State.

A great interest has been awakened in agricultural education, the farmers' institute work has been greatly extended and improved and the publications of the Board of Agriculture are in greater demand than ever before.

Very respectfully,

Geo. B. Ellis, Secretary.

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OFFICERS OF STATE BOARD OF AGRICULTURE 1903.

President—F. J. Hess, Charleston.
Vice-President—C. F. Afflick, Clarence.
Secretary—Geo. B. Ellis, Columbia.
Assistant Secretary—Snowdon Willis, Columbia.
Treasurer—H. H. Banks, Columbia.
Veterinarian—Dr. D. F. Luckey, Columbia.

EXECUTIVE COMMITTEE.

F. J. Hess, Charleston.
C. F. Afflick, Clarence.
H. J. Waters, Columbia.
W. C. Howell, Ulman.
W. L. Bryant, Independence.
W. R. Wilkinson, St. Louis.
J. J. Conrad, Marble Hill.

EX-OFFICIO MEMBERS.

Governor of Missouri—A. M. Dockery.
Superintendent of Schools—W. T. Carrington.
Dean Agricultural College—H. J. Waters.

CORPORATE MEMBERS.

Name.	Postoffice.	No. Dist.	County.
Chas. F. Afflick	Clarence	1st	Shelby
John W. Hill	Chillicothe	2nd	Livingston
Alex. Maitland	Richmond	3rd	Ray
S. H. Prather	Tarkio	4th	Atchison
W. L. Bryant	Independence	5th	Jackson
H. F. Hand	Taberville	6th	St.Clair
N. H. Gentry	Sedalia	7th	Pettis
Wm. C. Howell	Ulman	8th	Miller
J. A. Potts	Mexico	9th	Audrain
Chas. L. Boisselier	Gumbo	10th	St. Louis
N. J. Colman	St. Louis	11th	Chemical Bldg.
W. R. Wilkinson	St. Louis	12th	212 N. Main St.
J. J. Conrad	Marble Hill	13th	Bollinger
Ferd. J. Hess	Charleston	14th	Mississippi
J. J. McNatt	McNatt	15th	McDonald
A. T. Nelson	Lebanon	16th	Laclede

ANNUAL MEETING.

OFFICE OF THE SECRETARY,
COLUMBIA, MISSOURI, December 16, 1902.

The Board of Agriculture met in the office of the Secretary. Meeting called to order by the President, W. R. Wilkinson. The Secretary called the roll and the following answered present:

W. T. Carrington, H. J. Waters, Chas. F. Afflick, J. W. Hill, Alex-Maitland, W. L. Bryant, H. F. Hand, N H. Gentry, W. C. Howell, J. A. Potts and W. R. Wilkinson.

Upon motion of H. J. Waters, the reading of the minutes of the last annual meeting was dispensed with and the minutes as printed in the 34th Annual Report were adopted.

The Secretary read the following report, which was accepted and ordered printed in Annual Report.

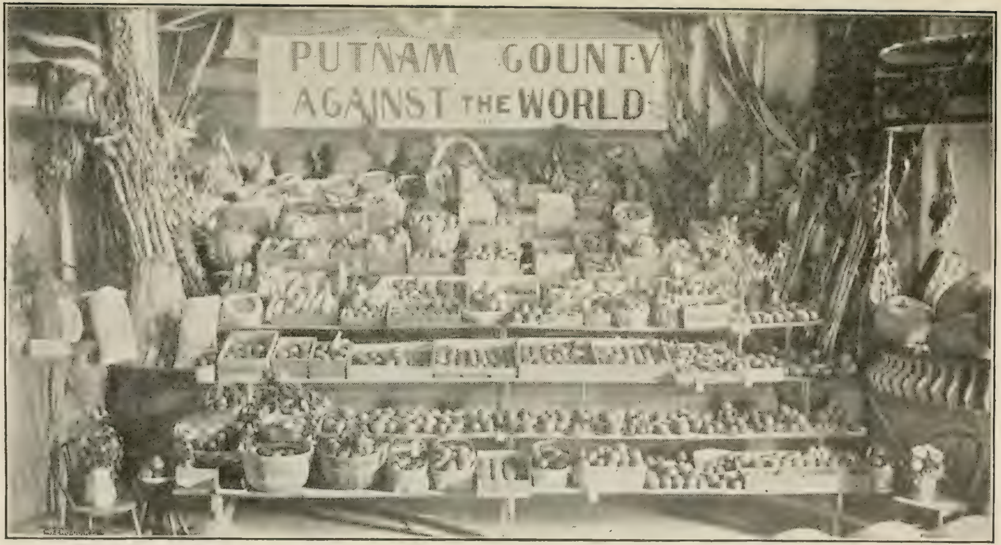
REPORT OF SECRETARY.

Members Board of Agriculture:

The first Agricultural Society in this State was incorporated by the Legislature, February 24, 1853. This no doubt led to the act of the Legislature incorporating the State Board of Agriculture twelve years later. The Board was first organized March 13, 1865, and was reorganized in 1891 upon a much broader and better basis.

By the examination of the records of this office we find that some of the questions that were given consideration in the first years of the Board's existence are still questions of importance to the farmers of the State. The subject of Agricultural education received prominence in the first annual report issued in 1866, and has received the encouragement of the Board up to this time. The progress has been slow it is true, but much ignorance and prejudice have been overcome, and at the present time Agriculture is one of the branches required in the course of study for teachers in our public schools, each of the three State Normal Schools has a department of Agriculture where Agriculture is taught to the teachers, the summer school for teachers of the State University gives prominence to this subject, and the Agricultural College is now recognized as one of the most important departments in the University, and is doing a great work for Agricultural education. The publication of the first bulletin devoted exclusively to the subject of Agriculture in our public schools was issued from our Agricultural College only a few weeks ago, and arrangments are being made for the regular issue of a bulletin devoted to this subject in sufficient numbers to supply all the teachers of the State. This is no doubt the direct result of your action taken at your last annual meeting, recommending that a bulletin on Teaching Agriculture in the Public Schools be published by the Agricultural College and distributed free to the twelve thousand rural teachers of the State. In compliance with that recommendation Hon. W. T. Carrington and your Secretary, the committee appointed for that purpose, presented the subject to President Jesse and Dean Waters, and I am pleased to report that it met with their hearty approval, and later on the Board of Curators endorsed the movement, and now that this advanced step has been taken, if it meets with liberal support from the Legislature a great deal of good will be accomplished. Other subjects prominently mentioned in some of the first reports of the Board were: The Improvement of Live Stock, Soil Drainage, Seed Selection, Crop Rotation and Better Methods of Cultivation. While many of the improved methods, advocated from time to time by the Board have been put into practice by a great many of the farmers, and great progress has been made, there is still room for improvement along all these lines.

The work of the State Board of Agriculture through these many years has been one of public spirit and patriotism. Your time has been given without remuneration, and the only reward you have received is in the consciousness of having contributed something to the material development of this great commonwealth. Just how much the work of the Board has contributed to the development of our agricultural resources cannot, of course, be determined, but that it has been a potent factor in this development, I think no one will deny. The improvement of our live stock and the improvement of our soil have been the constant watchwords of the Board since its first organization, and to-day we have the proud satisfaction of knowing that the best herds of Missouri are not surpassed by any country in the world. It may be said that this has been accomplished by individual energy and intelligence. Largely that is true, but that individuality needed a power, somewhere, to stimulate it to its best effort, and that stimulus has been furnished by the educational influences of this State, not the least of which is the work of the Board of Agriculture. Notwithstanding the fact that much of our farming


PUTNAM COUNTY
AGAINST THE WORLD

Institute exhibit at Unionville, Putnam county, 1902. By courtesy of Hon. B. H. Bonfoey.

lands have been in continued cultivation for from fifty to seventy-five years we have produced this year the largest yield per acre of both corn and wheat in the history of the State. Can this be attributed alone to the favorable season? Our season has been good; it has not been perfect by any means, and I think every member of the Board has seen in the past just as favorable seasons for the production of heavy crops. Some of the principal reasons for this bountiful crop are: First, the farmers have been growing more clover and cowpeas. Second, they have been more careful in saving and applying barnyard manure. Third, they have increased the amount of commercial fertilizers used. Fourth, they have adopted better systems of crop rotation. And fifth, and perhaps one of the greatest, is that during the long period of drouth in 1901 the evaporation of the moisture which was almost continuously arising from the soil brought up from deep down in the soil the plant food which had been carried down by the water in previous years, and the plant food was deposited upon the surface where it was available for plant growth this year. They have found out that it is best to couple intelligence and energy with physical force to insure a reasonable degree of success. The day of farming by physical force is past. Our system has changed from one of soil exhaustion to soil building, and I am confident that fifty years from now the average production of the lands of this State will be much greater than it is to-day.

CROP REVIEW FOR 1902.

WHEAT. A greatly increased acreage was sown in the fall of 1901. This was due to two reasons: First, to the fact that the yield of both the crops harvested in 1900-1 were above the average production and of excellent quality, and second on account of the disastrous drouth in 1901 a great many farmers sowed wheat for pasture to help take the stock through the winter. In sections where there was sufficient moisture and where the wheat was sowed in well prepared lands, the fall and spring pasture more than paid for the seed and expense of seeding. Over the northern and central portions of the State the winter was very dry during the early part of the season of 1902 and the seed made little growth, but as the season advanced there was sufficient rain to mature a bountiful crop. In many of the southwestern counties there were good rains in the fall of 1901, and the rain continued in the following spring and the wheat made too rank a growth, causing it to lodge badly which reduced the yield. The fields that were pastured heavily in this section produced the best crop. In some of the southeastern counties wheat was injured by the sleet in the winter which reduced the yield in that section. The quality of the wheat at harvest was not up to the standard of crops for 1901. The grain was rather small and on account of the excessive rains which continued from the time of harvest to late in the season over a great portion of the State, a great amount of damage was done to crops in the shock and stack and much of it was fit for nothing but stock feed. Basing the estimate upon the United States census report for 1900 the acreage yield and total production of the different sections for 1902, are shown in the following table:

WHEAT.

For crop harvested 1902.	Northeast Section, 20 counties....	Northwest Section, 21 counties......	Central Section, 21 counties......	Southwest Section, 23 counties......	Southeast Section, 29 counties......	Whole State, 114 counties..
Acres harvested................ ...	408,300	318,800	513,900	1,167,100	758,800	3,166,900
Acreage compared with 1901, per cent................................	189	137	124	198	113	151.4
Average yield per acre, bushels ..	22.4	22.4	22	18	16.4	19.3
Total yield in bushels	9,146,000	7,141,000	11,306,000	21,008,000	12,444,000	61,045,000
Quality of grain at time of harvest, per cent......................	95	93	92	94	88	92
Average price per bushel on farm November 1, 1902, cents.....	59.2	57.4	54.4	55.2	58.9	
Total value	$5,414,432	$4,098,934	$6,150,464	$11,596,416	$7,229,516	$34,490,000
New crop sown fall of 1902:						
Per cent of acreage sown compared with previous year........	99	80	90	80	101	89.1
Total acreage........................	404,200	255,000	462,600	933,700	766,400	2,821,900
Condition of growing plant December 1, per cent................	100	96	93	90	101	96
Condition at same time, 1901.......	83	100	90	95	86	91

WHEAT CROP SOWN FALL 1902.

The wheat was sown considerably later this year than the average. and most of it is small, and will be more easily injured by hard freezing than if it had a better growth for protection. In a few localities the Hessian fly had done considerable damage and several correspondents report injury from rains in early sown wheat on account of rotting before the seed germinated, but taken altogether the crop is in excellent condition. The acreage sown this year is about 11 per cent below last year. The greatest decrease being in the West-Central part of the State. The crop now sown, however, is 42 per cent larger than the crop harvested in 1900.

CORN.

The season was generally favorable for the growth of the corn crop, although in several of the extreme southeastern counties the crop was damaged by drouth, and in a number of the southwestern counties excessive rains prevented proper cultivation which reduced the yield. Taking the State as a whole, the yield is the largest on record. The total

Institute exhibit, Richmond, Ray county, Mo., 1902. By courtesy of Hon. Alex. Maitland.

production is 307,364,000 bushels. The largest crop previous was in 1895 when the total was 250,000,000 bushels. This makes an increase above that year of 57,000,000 bushels. The quality of the grain is good, although some damage has been sustained on account of heavy rains on that part of the crop which is in the shock, and in the corn where it was blown down. The damage is not great taken as a whole, as the average quality of the crop is 96 compared with an average of 45 last year. The total value of the crop, not including the fodder value, is $97,039,000. The five counties in the State having the largest acreage planted in corn are in the order named as follows: Nodaway, Bates, Atchison, Saline, and Vernon. A great many fields have made phenomenal yields, a number reported averaging 75 to 110 bushels per acre.

Further detailed information is given in the following table:

CORN.

	Northeast Section, 20 counties......	Northwest Section, 21 counties......	Central Section, 21 counties	Southwest Section, 23 counties	Southeast Section, 29 counties......	Whole State, 114 counties..
Acres in cultivation, 1902	1,509,000	2,363,000	1,171,000	1,731,000	919,000	7,693,000
Acreage compared with crop 1901, per cent................	108	105	104	96	98	102
Average yield per acre 1902, bushels......	43.3	43.6	41.3	35.5	31.8	40
Total yield in bushels, 1902...	65,340,000	103,026,000	48,321,000	61,451,000	29,226,000	307,364,000
Farm price per bushel November 1, 1902, cents........	30.6	31.4	29.5	31.7	37.5	32.1
Farm price per bushel November 1, 1901, cents........	55	54	61	63	72	62
*Total value of crop, 1902....	$19,994,000	$32,350,000	$14,255,000	$19,480,000	$10,960,000	$97,039,000
Average quality of grain 1902, per cent................	96	98	98	96	93	96
Average quality of grain 1901, per cent................	54	55	40	38	38	45
Per cent damage by frost, crop 1902....................	3	5	.3	.2	.5	1.8
Per cent fodder crop harvested 1902	23	24	34	27	48	31

*Grain only; does not include forage value.

OATS.

On account of the high price of seed oats in the spring the acreage sown to oats was decreased 15 per cent below the previous year. The oats in some localities failed to germinate or were killed by late freezing and about three per cent of the oat crop sown was plowed and planted to other crops. The greatest decrease of acreage was in the southwest section which was caused largely by it being too wet for seeding at the proper time. The average yield of the crop this year was 31 bushels per acre and of good quality at the time of harvesting, but on account of rain during and after harvest the crop was damaged 25 per cent.

MEADOWS.

The area devoted to the hay crop has been in the past few years about as stable as the area devoted to any of the principal farm crops. However, on account of the drouth last year which killed out a great many meadows the area this year has been reduced 15 per cent. The average yield per acre is given by all correspondents for timothy, 1.6 tons, clover 1.75 tons. The average yield of timothy for the past five years has been 1.55 tons. The average price of timothy per ton on November first, this year, was $6.57, and for clover, $5,86. The value of the hay crop in the State is exceeded only by the value of wheat and corn.

TABLE SHOWING YIELD AND FARM PRICES OF CROPS.

Crop Summary.	State......	Northeast section...	Northwest section...	Central section	Southwest section ..	Southeast section...
Crop yields for 1902 per acre:						
Kaffir corn, bush	27	22	20	36	31	25
Sorghum seed, bush	23	20	27	27	26	14
Sorghum syrup, gal	95	95	102	111	88	79
Broom corn, brush, lbs	646	600	... .	500	840	
Clover seed, bush	2.31	2.14	1.9	3.22	1.65	2.62
Timothy seed, bush	5.04	5.12	5.16	5.89	4.71	4.3
Flax seed, bush	7	7.33	10	6	3 80	
Irish potatoes, bush	122	144	149	120	106	92
Cow pea seed, bush	17.9	12	....	28.4	17.4	14
Tobacco, lbs	886	1010	1400	687	625	709
Alfalfa hay, tons	3.75	....	4.37	3.60	4.2	2.85
Cotton lint. lbs	521	....	....	....	475	567
Average price on farm Nov. 1, 1902, per bush.						
Corn, cents	32.1	30.6	31.4	29.5	31.7	37.5
Wheat, cents	57.0	59.2	57.4	54.4	55.2	58.9
Oats, "	27.3	24.7	26	26.3	26.5	33.2
Rye, "	47.1	44.4	43	44.2	49.1	54.7
Flax seed, dollars	1 04	1 06	..... .	1 02	1 04	
Irish Potatoes, cents	32.7	25.5	23.4	31.8	35.3	47.5
Timothy seed, dollars	1 71	1 41	1 55	1 81	1 62	2 18
Clover seed "	5 73	6 58	5 49	5 56	5 59	5 45
Cow pea seed "	1 33	1 64	....	1 31	1 17	1 19
Timothy hay, per ton, dollars	6 57	5 36	5 58	5 78	6 26	10 07
Clover hay, " "	5 86	4 76	5 07	5 31	5 22	8 93
Broom corn, " "	15 00	65 00	55 00	50 00	50 00	
Average price received for this year's crop, per lb:	55.00					
Lint cotton, cents	7.1	.. ..	....	....	7	7.3
Leaf tobacco, "	9.6	9	10	9.4	10	9.8
Wool, "	16.8	16.5	15.8	17	15.7	19

FARMERS' INSTITUTE WORK.

The farmers' institute work was inaugurated by the State Board of Agriculture at a meeting held in Independence, Missouri, December 29, 1882. From that time until the year 1891 the work was carried on without any appropriation for that purpose, and the meetings during all that time were conducted by the members and officers of the Board and public spirited citizens who serve without pay, and often paid their own expenses. The 36th General Assembly in 1891 appropriated $10,000 for institute work, and with that money a regular force of lecturers was employed and 81 meetings were held; 26 in 1891 and 55 in 1892. Each succeeding Assembly since that time has made an appropriation for this purpose. The amount appropriated for the last biennial period being $8,-000. With this sum 234 meetings have been held, and a number of meetings are now in progress, and others have been planned for in the next few weeks, and when they are finished it will make a total of 250 meetings held this period. One hundred and twenty of these meetings were held before the last annual meeting, and the remainder since that time. Sixty per cent of the meetings have been conducted for two days. The two annual meetings of the State Industrial Association were conducted for three days and the rest of the meetings for one day only. The one-day meetings have been attended by two or three lecturers, the two-day meetings by four or five lectures, and the State meetings by a number of lecturers.

The cost of the present meetings, compared with the cost of the first two years, is in a ratio of 32 to 123.4. Not only has the expense of holding these meetings been reduced, but the ability of the lecturers employed has been of a high standard as reference to the appended list will show. The attendance has been good with but few exceptions, and the farmers have taken a very great interest in the work. The exhibit feature has become more prominent, and I am sure is a great benefit. In nearly all the places fine displays have been made of orchard, garden, farm and other products. Many of these exhibits would do credit to the State, shown at the State Fair or other great expositions. One subject that has been given more than ordinary attention has been the subject of good roads. Twenty-five meetings have been held devoted entirely to this subject, and the plan of road construction and maintenance advocated by the lecturers has been put into practice in a number of counties, and has been approved by a number of our leading citizens. The plan of making hard dirt roads, as printed in the January bulletin, and which plan has been successfully operated for the past six years, by Mr. D. Ward King of Maitland, Missouri, has not only received the approval of a number of the citizens of this State, but it has attracted the attention of two other states, where the plan has been adopted.

A NEW FEATURE OF INSTITUTE WORK.

With the co-operation of the Agricultural College, a new feature of institute work has been inaugurated in a series of meetings that are now in progress. A passenger car has been placed at our disposal by the Missouri Pacific Railway Company, and the car is filled with material to be used in demonstration and for illustrating the lectures. The idea is to equip a car with material for use in any special line of work in which the farmer is interested, and in the car that is now being used in our meetings we have the following equipment:

FOR AGRICULTURE AND LIVE STOCK INSTRUCTION.

Specimens of the various important grasses and forage plants such as alfalfa, different varieties of cow peas, different varieties of soy beans, various clovers, and the important grasses adapted to different sections of the State.

Standard types of corn adapted to different classes of soils.

Collection of concentrated feeding stuffs such as linseed meal, cottonseed meal, gluten meal, etc., with their value for fattening cattle and for feeding dairy cows.

An exhibition of the commercial products manufactured from corn.

Collection of principal kinds of commercial fertilizers, with their value and proper use.

Paintings, diagrams, charts, photographs and magic lantern slides illustrating the most profitable types of beef and dairy cattle.

FOR INSTRUCTION IN HORTICULTURE.

Exhibit of properly grown fruit trees to illustrate the best methods of pruning and shaping trees.

Exhibit of typical commercial varieties of fruit.

Exhibit of spraying apparatus, including pumps, nozzles and spray materials, with the demonstration of their proper use.

Exhibits of common diseases of the apple, peach, pear, plum, grape and small fruits, with illustrations of the best methods of preventing them.

Exhibits of common insect pests of the orchard, garden and farm, with illustrations of the best methods of combating them.

A demonstration of how to plant and prune orchard trees.

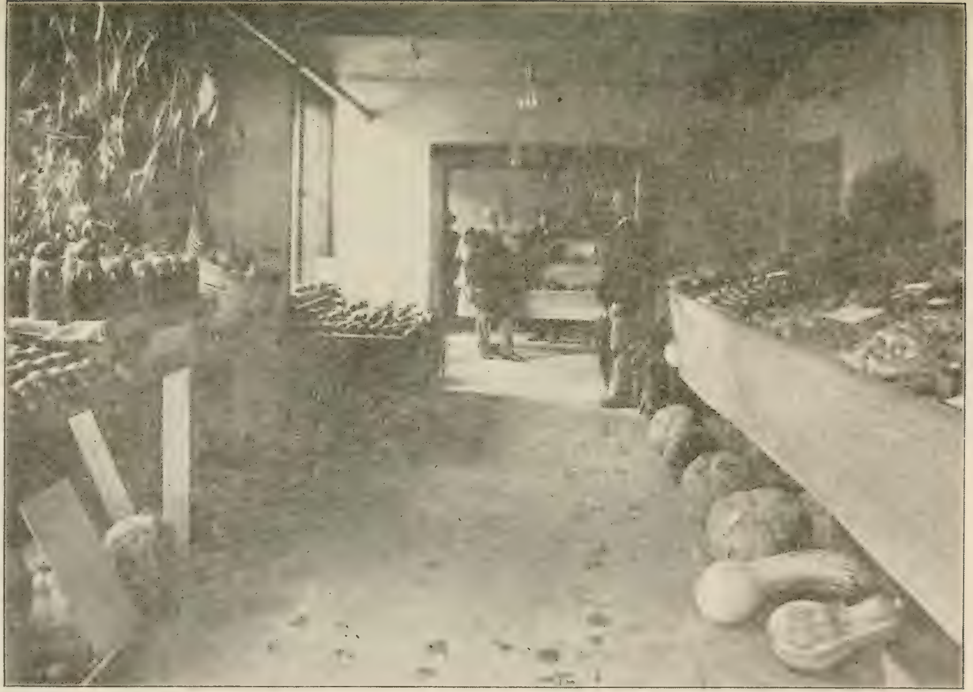
A demonstrtion of how to graft apple trees.

Charts, diagrams and drawings illustrating the best method of pruning trees in the orchard, and of training and pruning grape vines.

A demonstration of how to select strawberry plants for the largest crop.

ILLUSTRATING EVENING LECTURES.

Magic lantern views of the work of different departments of the Experiment Station, and illustrating student life in the Agricultural College.



Institute exhibit at Mt. Vernon, Lawrence county, 1902. This view shows only a small part of the exhibit.
By courtesy of A. W. Orr.

STANDARD AGRICULTURAL LIBRARIES.

Exhibits of the best half a dozen books:

For the general farmer.

For the live stock farmer.

For the dairyman.

For the commercial orchardist.

For the small fruit grower.

For the vegetable grower.

A list of the best bulletins and reports for free distribution, relating to cattle feeding, hog feeding, corn growing, cowpeas, clover, soy beans, alfalfa, dairying, fruit growing, vegetable growing, etc.

Up to this date seven meetings have been held with the exhibit car feature and the success of the plan has been far beyond our most sanguine expectations. I am confident that it will be an excellent idea for the State Board of Agriculture and the Agricultural College to own their own car for this purpose, and in the future to conduct most of their meetings on this plan. Concerning this movement and the farmers' institute work in general the St. Louis Republic of December 14, 1902, makes the following statement:

"The Missouri farmers' institute meetings of the past have been produtctive of such good results that a departure has been decided upon. An exhibit car is to be a feature at every meeting.

"For those sections of the State where dairying is the most important feature the car will be a traveling dairy school, and all the practical points connected with the production of milk, dairy manufacturing, packing, judging and marketing will be fully demonstrated.

"In other sections, where the fruit interests dominate, the car will be converted into a traveling horticultural school, carrying the special equipment bearing upon this subject.

"Where the live stock interests are paramount, typical specimens of live stock will be carried and demonstrations of how to judge animals for the different purposes will be made.

NEW ERA IN FARM INDUSTRY.

"The present agitation marks the beginning of a new era in the development of the farming industry. The educators and developers are epoch makers. It is no longer necessary to discuss with the intelligent farmer the necessity for some kind of an educational effort to improve his methods in farm operations. The man who uses his hands only must be left behind, but the man who uses his intellect to direct his hands will succeed."

The lecturers that have been employed this year and the subjects that have been discussed ar given in the following list:

H. J. WATERS, DEAN OF THE AGRICULTURAL COLLEGE AND DIRECTOR OF THE EXPERIMENT STATION.

Subjects:
  The Utilization of the Corn Crop.
  Clover, Cowpeas and Alfalfa.
  The Profitable Use of the Corn Fodder Crop.
  The Work of the Agricultural College and Experiment Station.

DR. D. F. LUCKEY, STATE VETERINARIAN, COLUMBIA, MO.

Subjects:
  The Prevention of Contagious Diseases Among Live Stock.
  Vaccine and Vaccination of Live Stock.
  Diseases of Poultry.
  The Horse's Foot.
  The Horse's Teeth.
  The State Veterinary Work.
  Laws Pertaining to Contagious Diseases of Live Stock.

F. B. MUMFORD, PROFESSOR OF AGRICULTURE, MISSOURI AGRICULTURAL COLLEGE.

Subjects:
  Some Factors in the Economical Production of Beef.
  Practical Methods of Improving the Common Stock of Missouri.
  Alfalfa for Missouri.
  Agricultural Education.

T. E. ORR, SECRETARY OF THE AMERICAN POULTRY ASSOCIATION, BEAVER, PENNSYLVANIA.

Subjects:
  1. Poultry Topics:
  Poultry as a Side Line for Farmers.

(a) Poultry Houses; (b) Poultry Yards; (c) Poultry Feeding; (d) Marketing Eggs and Poultry.

2. Poultry as a Business:

(a) Getting Started; (b) Growing Into It; (c) Essentials and Flourishes.

3. The Business Poultry Plant.
    (a) Range; (b) Yards; (c) Houses; (d) Implements.
4. Poultry Work.
    (a) Hatching; (b) Brooding; (c) Feeding; (d) Enemies.

GENERAL INSTITUTE TOPICS.

Subjects:

The Specialist or the General Farmer.
The Horse the Farmer Should Raise.
What Sheep Have Done.
Grain Selling or Stock Growing.
The Hog Man's Rotation.

DR. J. C. WHITTEN, HORTICULTURIST OF MISSOURI EXPERIMENT STATION.

Subjects:

Garden and Orchard.
Some Fruit Diseases and Their Remedies.
Plant Breeding.
Some Lessons From European Agriculture.

MR. EUCLID N. COBB, A PRACTICAL DAIRYMAN, MONMOUTH, ILL.

Subjects:

The Dairy Cow and Her product; How Shall We Handle Them?
The Incubator and Brooder House; How to be Successful With Both.
The Value of Ensilage in the Dairy and Feed Lot.
How to Build and How to Fill a Silo.
Up-to-date Farming and What It Will Do for the Farmer.
A Profitable System of Crop Rotation.

JOHN T. STINSON, DIRECTOR OF THE SOUTH MISSOURI FRUIT-EXPERIMENT STATION, MOUNTAIN GROVE, MISSOURI.

Subjects:

- General Orchard Management.
- Spraying for Bitter Rot.
- Fruit Diseases and Remedies.

COL. G. W. WATERS, EXPERIENCED INSTITUTE LECTURER, CANTON, MISSOURI.

Subjects:

- Clover, Alfalfa and Cow Peas.
- A Simple and Inexpensive Method of Improving and Maintaining Our Public Roads.
- Profitable Pig Feeding.

DR. G. M. TUCKER, PROFESSOR OF SOIL PHYSICS, MISSOURI AGRICULTURAL COLLEGE.

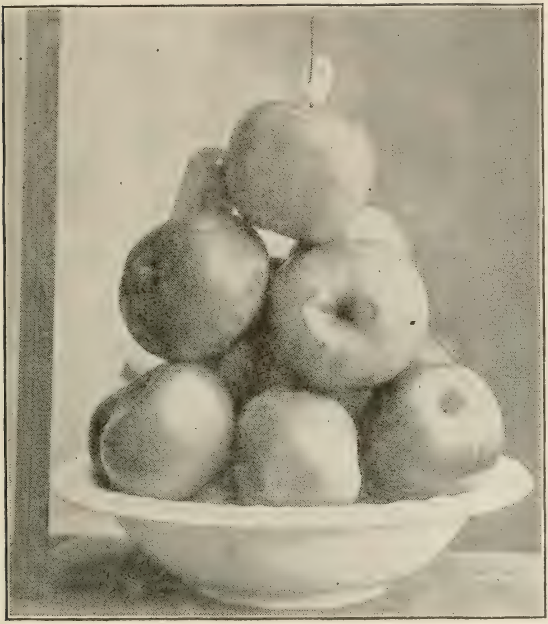
Subjects:

- Agricultural Education:
  - What Agricultural Education is; The Desirability of it for Farmers; When should it Begin; What Does it Do? Common Schools; High Schools; Agricultural College.
- Soil Fertility:
  - What is Soil Fertility? Influence of Physical Character of Soil: Influence of Water; Sources of Loss of Fertility, Natural, Cropping; Ways of Restoring Fertility; Rotation of Crops; Fertilizers; Stock.
- Commercial Fertilizers:
  - Sources, Uses and Needs of Nitrogen, Potash and Phosphoric Acid; Ready Mixed and Home Mixed Fertilizers; Methods of Usng Fertlzers; Purchase of Fertlizers.

DR. A. J. DETWEILER, BACTERIOLOGIST OF STATE BOARD OF HEALTH.

Subjects:

- The Relation of Water to Disease.
- The Nature of Contagion and How it is Spread.
- The Disposal of Sewage and Garbage.
- Toxine, Anti-toxine and Vaccine.



A Baker's Dozen of Putnam County Apples, measuring 16 inches in height, shown at Farmers' Institute, 1902. By courtesy of Hon. B. H. Bonfoey.

W. P. HARNED, FARMER AND BREEDER, VERMONT, MO.

Subjects:

The Most Profitable Farm Crops.
The Grain Farmer vs. The Stock Grower.
The Modern Cow.
The Farmer Boy's Calf.

N. F. MURRAY, EX-PRESIDENT OF STATE HORTICULTURE SOCIETY, OREGON, MISSOURI.

Subjects:

Orchard Management.
Marketing the Fruit Crop.
The Canning Industry.

C. H. ECKLES, PROFESSOR OF DAIRY HUSBANDRY, MISSOURI AGRICULTURAL COLLEGE.

Subjects:

Selection, Feeding and Care of the Dairy Herd.
The Profits in Dairying.
The Farm Separator and Farm Butter Making.
The Value of Ensilage as a Feed for Dairy Cows.

DR. R. C. MOORE, PRESIDENT OF KANSAS CITY VETERINARY COLLEGE AND DEPUTY STATE VETERINARIAN.

Subjects:

Vaccine and Vaccination of Live Stock.
Diseases of the Horse.

DR. T. E. WHITE, EX-STATE VETERINARIAN, SEDALIA, MO.

Subjects:

Live Stock Sanitation.
Live Stock Diseases.

G. W. WILLIAMS, HUMANSVILLE, MISSOURI.

Subjects:

Alfalfa in Southwest Missouri.
Scientific Bee Keeping.
Berry Growing.

W. L. HOWARD, ASSISTANT IN HORTICULTURE, MISSOURI EXPERIMENT STATION.

Subjects:

Planting and Cultivating Fruit Trees.
Fungous Diseases and Remedies.
Teaching Agriculture in the Public Schools.

D. WARD KING, PRACTICAL FARMER, MAITLAND, MO.

Subjects:

Improvement and Maintenance of Our Public Roads.
The Education of the Horse.

C. D. LYON, GENERAL FARMER, HIGGINSPORT, OHIO.

Subjects:

Keeping up the Fertility of the Soil.
Legumes as Soil Improvers.
Some Questions of Tillage.
Special Farm Crops.
The Farm Garden.

R. W. CLOTHIER, PROFESSOR OF AGRICULTURE, CAPE GIRARDEAU, MISSOURI.

Subjects:

Alfalfa Growing in Southeast Missouri.
Soil Improvement.
Agricultural Education.

MR. W. D. McKEE, BREEDER AND FARMER, POLO, MISSOURI.

Subjects:

The Improvement of Our Cattle.
Free and Gratuitous Literature Prepared by the State and Government; What it is Worth to the Farmer.

Dr. R. H. Jesse, President of University of Missouri, Hon. John R. Kirk, President of Kirksville Normal, and Prof. S. A. Hoover, Teacher of Agriculture, Warrensburg Normal, each attended several meetings and addressed the farmers on educational topics, and their lectures were highly appreciated.

VETERINARY SERVICE.

The Veterinary Department of the Board of Agriculture was established for the purpose of assisting in the development and protection of the live stock industry of the State. To fulfill this purpose requires two distinct lines of work; investigation and control of diseases. These are both important but before the Board can know how to control the spread of a disease in the best way the natural cause of that disease must be understood. The Board in the past few years has co-operated with the Experiment Station in the work of investigation of live-stock diseases to the great benefit of the live-stock owners. Especially is this true of the investigation of Texas Fever by Dr. J. W. Connaway, who has been assisted by the funds of the Board. New diseases will break out and the facilities for this work of investigation should be increased until they are ample to give the live-stock interests the best possible protection.

In compliance with the provisions of sections 10545-6 of the Revised Statutes, 207 investigations have been made by the veterinarians since January first. One hundred and fifty-three of these cases were diagnosed glanders, two anthrax, nine Texas fever, one rabies and the other forty-two cases were of a less dangerous character, and many of them not contagious. In a great many of these cases more than one animal was affected, and in all several thousand animals exposed. The prompt action in having these animals destroyed or placed under control, and thereby preventing further danger, has been a great service to the stock owners.

The increase in the number of cases of glanders has most all been reported from the district of Kansas City. A deputy veterinarian has been appointed who lives in Kansas City, and who can give prompt attention to all the cases reported. With the co-operation of the local Board of Health and the county court it is thought that the infection there is about stamped out.

TEXAS FEVER AND LIVE STOCK INSPECTION.

Notwithstanding the fact that the Texas Fever outbreaks were more numerous all over the country this year than usual, occasioned, no doubt, by the dry weather and the ground being protected with snow most of the time during the winter, no infested cattle, so far as we can ascertain, have been permitted to be shipped or driven from the counties in this State where infection is known to exist. The number of cases in the counties where infection exists has been much greater than in the year 1901. These cases have been found only in the counties of Jasper, Newton, McDonald, Howell. The only infection reported in Howell county is in Thayer township. The infection in Jasper county is found in only three congressional townships, and principally in the vicinity of Joplin, township 27, ranges 33-34. The infection in Newton county is found in ten congressional townships and principally in the vicinity of Neosho. The infection in McDonald county is found in three congressional townships and principally in the vicinity of Southwest City and Tiff City.

The Inspectors have been instructed to be diligent in preventing violators from driving cattle into the State from infested districts, and have been instructed to try and locate every infected field, pasture or range, and to promptly place the same in quarantine. A number of guilty parties have been arrested and the cases are now pending in the courts. The inspection of cattle coming into Missouri from below the quarantine line has been assumed by the Bureau of Animal Industry, under the provisions of the quarantine regulations of the State, and the State Inspectors employed by the Board have been enabled to give all their time to the control of diseases within the State.

It would be very unwise to discontinue this work of inspection and quarantine and an adequate sum of money should be always at the command of the Board to employ a sufficient number of men to locate and quarantine all infested cattle and pastures and prevent the driving of cattle into this State contrary to quarantine laws and regulations. It takes some time for the inspector to become familiar with the country and the people who are in sympathy with the enforcement of the law, and those who are not in sympathy with the law. The rule that "an ounce of prevention is worth a pound of cure" applies here. The influence of an active, honest, fearless inspector will prevent many violations. These facts should be taken into consideration when an inspector is employed, and, while it might seem at times that there is no need for an inspector or a number of inspectors, yet the spread of Texas Fever from a single violation might cause a greater loss to the cattle interests of the State than the expense of maintaining several inspectors the entire year. Owing to the rough and sparsely inhabited country along the boundary between Missouri and Arkansas it is difficult for one man to cover a great deal of country, and it seems to me that it would be wise to have a sufficient number of inspectors to visit every portion of the line as often as once each month.

The report of the veterinarian herewith appended will give further information.

REPORT OF STATE VETERINARIAN.

To the Missouri State Board of Agriculture:

Gentlemen—During the past year the work of the Veterinary Department has been greater in extent than ever before. There has been held a greater number of farmers' institutes than ever before in one year and this work has consumed a good deal of time.

From some cause there has been a greater number of outbreaks of glanders than has ever been reported in a single year. This may be mostly attributed to the increased traffic in horses and mules, occasioned by the demand for horses and mules for the War Department of this country and England, the demand for horses and mules for use in grading in and about the World's Fair ground and for use in grading for railroad construction. At any rate, the demand for work horses and mules has been very great on every hand and the traffic in them has been in proportion. It is not unexpected nor discouraging, therefore, that there were a greater number of outbreaks of glanders than usually occur.

During the drouth of 1901 a large per cent of the hogs, sheep and cattle of the State were shipped to the market and to other States. In re supplying the farmers with stock cattle during the summer of 1902, after abundant crops were assured, as would naturally be expected, there were conveyed into the State more or less of the contagious diseases. Prominent among these diseases was tick (Texas) fever. Outbreaks of tick fever occurred in nine different lots of cattle in North and Central Missouri where the disease heretofore has been practically unknown. All of these outbreaks were promptly controlled and the infection eradicated and there is nothing further to be feared from this disease during the coming year, unless there is new infection introduced into the State. It is a matter worthy of note that the ticks which caused the outbreaks of fever in this State in every case were picked up by native cattle in the native pens in the various stock yards, or in cars, which had not been properly disinfected, in which the cattle were shipped. The disease occurred among cattle which, as a rule, were known to be from areas entirely free from fever ticks and far removed from the permanently infested section of the United States.

There were introduced by this shipment a few other diseases of minor importance. Among them were mange and malignant catarrh. The mange has occurred in only a few places, as far as I am able to learn, and as it can easily be controlled and cured, it will probably not do a great amount of harm. Malignant catarrh, however, has broken out in numerous localities in this State and, principally owing to the fact that the affected cattle are not well cared for, is causing considerable loss.

MALIGNANT CATARRH.

The majority of outbreaks have occurred in lots of cattle where it appeared to have been introduced by cattle brought from the various stock yards. In some instances, however, it started among lots of cattle apparently in a spontaneous manner. It is a disease not very well understood and is difficult to control. While it appears among cattle in a spontaneous manner, it usually affects all of the young cattle in the lot and some of the older ones and thus far appears to be contagious. The symptoms are barely noticeable to the ordinary observer up to a few days before the death of the affected animals takes place. The first noticeable symptom is a catarrhal discharge from the nose and eyes. This is usually thought to be "pink eye," from which the animal apparently recovers. The catarrhal conditions gradually spread to the air passages and cause a short, dry cough. The temperature is often found to run as high as 106 degrees. The digestive organs appear to become seriously involved only during the last stages. The appetite remains good during the course of the disease, but the digestion is impaired and the food, consumed by the affected animal, appears to have no nourishing effect. When extremely weakened from the ravages of the disease for from three days to ten or twelve weeks, the affected animal usually ends up with dysentery and dies from exhaustion and inanition.

There were a large number of sheep shipped into the State during the past fall. As would naturally be expected, some of them were affected with scab. The number of outbreaks, however, has not been alarming and I anticipate no trouble in controlling the disease.

During the winter of 1901 and 1902 the supply of hogs in this State ran down very low. During the summer of 1902 an abundant crop of corn was raised and the demand for hogs to which to feed it was almost unlimited. There was quite a traffic in stock hogs and by this and other means hog cholera has gained quite a foothold in the State. During the three years previous to October 1st, 1902, there was hardly any hog cholera to be found in the State. Hogs died here and there in small numbers of different diseases, most of which were of minor importance. Since October 1st, 1902, the hog cholera, diagnosed as such by expert meat inspectors in the various packing houses, has made its appearance in many different localities in the State. Unless these outbreaks are controlled promptly and the most radical means used right away, for its suppression, the farmers of the State are liable to suffer enormous losses during the summer of 1903.

CONTROL WORK.

According to the custom of the Veterinary Department during the past, an attempt has been made to control all outbreaks of contagious diseases among the domestic animals and to eradicate the disease from the vicinity in which it existed, as promptly as possible. The letters from veterinarians of the State and petitions from freeholders, giving notices of outbreaks of contagious diseases, have all been answered with as much dispatch as possible. The increased traffic in horses the past few years has resulted in an unusual number of outbreaks of glanders. The shipping in of stock cattle to take the place of cattle which were shipped out during the drouth has resulted in the introduction of tick fever into localities in this State in which the disease has probably never existed before. There were two outbreaks of anthrax in the State during the year, and the source of the infection has never been known. All of the outbreaks of glanders and anthrax have been promptly controlled and the infection eradicated. All of the outbreaks of tick fever, except in the permanently infested area in South Missouri, have been controlled and the infection eradicated.

HOG AND SHEEP DISEASES.

Up to the present time no aggressive effort has been made to control the outbreaks of contagious diseases of hogs and sheep. The principal diseases of these animals, which we may expect to find in this State, are hog cholera and sheep scab. Neither of these diseases has any extensive foothold in the State, and at present, although hog cholera is spreading rapidly, I believe that both can be eradicated from the State entirely if an aggressive fight is made immediately.

During the past two years, through the courtesy of the United States Bureau of Animal Industry, our Department has been furnished prompt notices of the receipt at any of the stock yards of any hogs affected with hog cholera or sheep affected with scab. The notice gives the name of the shipper, the place from which the stock was shipped, the date of shipment and the route and number of car on which shipment was made. This information is sufficient to enable the State Veterinarian to make a thorough investigation. We have tried to give the necessary attention to these outbreaks, but have not had a sufficient force of veterinarians to do it. If there were enough deputy veterinarians over the State, one could be sent to the point of origin of each car of infected stock to control the outbreak and advise the proper modes of disinfection. By selecting deputies in the different sections of the State, things can be arranged so that no deputy will have to travel any great distance and the extra cost of this work will therefore amount to a comparatively small sum. I beg leave to ask the approval of the Board to my plan to make an aggressive fight during the coming year against hog cholera and sheep scab and other diseases of hogs and sheep. The plan of the work will be to go in person or send a deputy to investigate the outbreak at the point of origin of any car of infected stock and give attention to proper notices of the existence of the hog and sheep diseases from whatever source. An investigation of the nature of the disease will be made, the necessary quarantine restrictions enforced and all possible advice given the owner of diseased stock as to the best methods of getting rid of the disease and disinfecting his premises.

BLACK LEG.

Black leg is somewhat prevalent over the State at the present time, but where preventive vaccination has been practiced there have been but small losses. The preventive vaccination has proved a great success, and cattlemen have been advised to use it freely. In order to encourage the use of vaccine, the Veterinary Department has arranged to co-operate with the United States Department of Agriculture in the distribution of vaccine throughout this State. The August bulletin of 1902 was principally devoted to the subject of black leg, and in it was given the information necessary for the stockmen to use in the prevention of the disease. While two thousand extra copies of this bulletin were printed last August, the supply is about exhausted.

TICK FEVER.

The plan of placing a quarantine on each bunch of cattle within this State, found to be infested with fever ticks, has worked out admirably during the past year. There has been a large number of farms and bunches of cattle quarantined in the permanently infested area in Southwest Missouri, and without any county or township quarantine, not a single bunch of infested cattle originating in Missouri has reached any non-infested territory.

I do not think it advisable, with the exception of Thayer township, for the Board to put a quarantine on any county or township in this State. The principal reason is that the infected farms in Southwest Missouri are somewhat scattered, and in order to quarantine, even the township in which the infected farms are situated, a good deal of non-infected territory must necessarily be included. It will require a great deal of an inspector's time to go to railroad points and inspect the cattle for shipment which have originated in the non-infested portion of the quarantined township or county. It often happens that such an inspection requires his attention exactly at a time when he should be rounding up some bunch of infested cattle or on guard on the State line. It is also important to notice that where there are only three or four infested farms in a township that, if the entire township is quarantined by the Board, restrictions are placed on the movement of the healthy cattle and the infested cattle have the liberty of the whole township and, if allowed to exercise this liberty, the infection will gradually spread.

The infection in Southwest Missouri is not so scattered but that an inspector can locate and quarantine every infected farm. He will even have time to return to these farms occasionally to see if the necessary dipping has been done to disinfect the cattle. By following the plan of quarantining individual farms, the spread of the infection has been successfully controlled. The owner of the infested cattle has by this method an opportunity to get from the inspector all the information he needs in the disinfection of his cattle and land, and the restrictions on the movement of a bunch of infested cattle brings the owner face to face with the necessity of getting rid of the infection.

For the coming year I recommend:

(1) That the Board adopt the Federal Quarantine Line as it was placed last year.

(2) That the enforcement of the quarantine relating to the interstate movement of cattle be left as much as possible to the Federal inspectors and that these inspectors be authorized by the Board to enforce necessary local quarantine within this State.

(3) That the State lend its assistance, when necessary, to the Federal inspectors, but that our main effort should be to eradicate the infection from the areas within this State that have heretofore been considered permanently infected territory.

(4) That the State Veterinarian appoint only one inspector and locate him at some point in Southwest Missouri convenient to the infested area.

(5) That the Board place a quarantine on Thayer township.

The reason for advising that Thayer township be placed in quarantine is that practically all of this township is infested, and there is usually only a very small number of cattle in the township that anyone cares to move. The vacant lots surrounding the shipping pens at Thayer are infested with fever ticks every year, and I consider it impossible for anyone to drive a bunch of cattle from outside of the township and get them into the shipping pens during the summer and fall without exposing the cattle to the infested ground surrounding the pen. The shipment of cattle from

Thayer during the summer and fall should not be permitted. This can be controlled by refusing to inspect and pass cattle at such times as the infection is known by the inspector to be present.

NECESSITY OF MORE DEPUTIES.

While I have not completed the list of names of some twelve or fifteen more deputies which I wish to appoint to assist in control work during the coming year, I have in view to appoint as many more capable men in different parts of the State as may be needed. The additional number of deputies will not necessarily increase the cost of the service except inasmuch as the work increases. In order to carry out the plan of eradicating hog and sheep diseases economically, more deputies will be absolutely necessary. I will try to have a list of names ready to submit to the Executive Committee at its January meeting, and I hope the Board will authorize this Committee to approve such appointments as seem acceptable to it.

SPECIAL INVESTIGATION.

During the past year a contagious disease among swine has appeared in Boone, Saline, Carroll and other counties. The nature of this disease is not well understood at the present time. The State Veterinarian should have the opportunity to investigate this and all other similar diseases and control them properly before they spread all over the State. A thorough study of the parasitic diseases of hogs and sheep should be made in this State during the coming year, and information as to their prevention given out to the public as soon as possible. The necessity of special investigation is very great at the present time, and it is absolutely necessary to arrange to leave more of the control work to deputies and give the State Veterinarian an opportunity to make investigations of outbreaks of diseases that are not already understood. I believe this will be serving the best interests of the State.

FOOT AND MOUTH DISEASE.

Reports are out to the effect that foot and mouth disease exists in Massachusetts, Connecticut and Rhode Island. While it is the duty of the Board to duly protect this State against the introduction of this disease, I do not think that there is at present any sufficient reason for quarantining against Eastern cattle. There are several reasons for not issuing additional quarantine regulations until they are an absolute necessity. However, if any information comes to hand at the annual meeting which indicates any danger of the introduction of foot and mouth disease into the State, a quarantine against Eastern cattle should be made immediately.

Most respectfully submitted,

D. F. LUCKEY,
State Veterinarian.

REPORT OF DR. MOORE.

Kansas City, Mo., Dec. 15, 1902.

Mr. Geo. B. Ellis, Sec'y Missouri State Board of Agriculture, Columbia, Mo.:

Dear Sir—In response to your request of the 12th inst., have the honor to submit the following as a brief report of the work done by me in Kansas City and vicinity:

From January 14th to December 1st, 1902, there have been examined about 1,200 horses and mules, 129 horses and 7 mules were found to be afflicted with glanders and condemned. Of those condemned, 19 were tested with mallein. Forty-three were destroyed by consent of the owner without appraisement. In most instances the county court allowed parties the sum of $5.00 for animals destroyed without appraisement. Thirteen visits have been made to inspect cattle and three to inspect horses outside of Kansas City. Two horses near Pleasant Hill, Mo., were found to be afflicted with glanders, one was destroyed by consent of owner without process of law. Four outbreaks of Texas fever were investigated, one each at Belvidere, Belton, Holden and Marshall. About 400 cattle were exposed and quarantined of which nearly 100 died. In each instance the disease was limited by quarantine to the animals exposed before arrival.

The sources of contagion for the cases of glanders reported in Kansas City are not often ascertainable, the cases occurring one here and one there, but from what can be learned it seems probable that virus is conveyed from animal to animal by means of the public watering basins, which are so constructed that the overflow is into a central pipe and the margins of the basin are not thereby washed and the virus carried away. The citizens and officers of this city are co-operating by promptly reporting all suspected cases and I believe that the disease is now very much less prevalent than during the summer.

Very respectfully,

R. C. Moore, D. V. S.,
Deputy State Veterinarian.

ENFORCEMENT OF THE ANTI-BUTTERINE LAW.

There have been a greater number of cases filed and a greater number successfully prosecuted under this law this year than any previous year since the law was enacted. In Kansas City the Inspector has obtained evidence which resulted in the conviction of four cases in the Federal Court for violation of the United States law, 17 cases have been filed under the

State law, and 5 of these have been tried and the parties convicted; one has been lost and the remainder are still pending in the different divisions of the Kansas City Court.

Owing to the beneficial effect of what is known as the Grout bill, the services of the Inspector at Kansas City have been dispensed with since September 5th, and since that time the Inspector has been paid a fee for each conviction. He has secured three convictions under this agreement.

The St. Louis Inspector has been employed the whole year. Mr. J. H. Wilkinson has served as inspector, and a larger number of cases have been filed and greater number of prosecutions have been won in the city of St. Louis than any year previous in the entire State. For detailed information in regard to the situation in St. Louis I refer to the following report by the Inspector:

St. Louis, Mo., December 6th, 1902.

To the Missouri State Board of Agriculture, Columbia, Mo.:

Gentlemen—I herewith submit the following report of the work done in the city of St. Louis toward the enforcement of the Olemargarine law, for the year commencing with December 16, 1901, the date of my last annual report.

During the past year suit has been filed and judgment rendered in the justice court in each of the following cases, to-wit:

The State of Missouri vs.

Alex McCabe	Judgment	for	Defendant	Appellant,	State
Jas. J. Bowlin	“	“	“	“	“
Jos. Adler	“	“	“	“	“
Edward Olszewiski	“	“	“	“	“
Hess & Baltezor	“	“	“	“	“
Chas. H. Timmerberg	“	“	“	“	“
Jas. A. Barnes	“	“	“	“	“
Ferdinand Rossi	“	“	“	“	“
H. W. Damme	“	“	“	“	“
Wm. Zeltmann	“	“	“	“	“
Louis Meyer	“	“	“	“	“
Geo. Goener	“	“	“	“	“
Hilmer-Scheitlin Com. Co.	“	“	“	“	“
N. A. Quigley	“	“	“	“	“
L. R. Manion	“	“	“	“	“
F. B. Hunter	“	“	State	No appeal	
George Harris	“	“	“	“	“
W. W. Britt	“	“	Defendant		State
J. B. Ackfeld	“	“	“		“
Henry Fasterling et al.	“	“	“		“

Henry Vandeloecht	Judgment for Defendant	State
Wm. E. Vach	“ “ “	“
John Madsten	“ “ “	“
Otto Schmidt	“ “ “	“
Robert Fleming	“ “ “	“
P. J. Ryan	“ “ “	“
C. E. Sanner Grocery Co.	“ “ “	“
Albert Schramm	“ “ “	“
John Petersen	“ “ “	“
Bauer & Budo	“ “ “	“
Anna M. Beckerkord	“ “ “	“
Edward Eiben	“ “ “	“
Fred. Koch	“ “ “	“
Chas. H. Hilf	“ “ “	“
Chas. F. Lang	“ “ “	“
Will Docter	“ “ “	“
Gustave Klein	“ “ “	“
Godfrey Wolf	“ “ “	“
Herman Buehler	“ “ “	“
Wm. G. Hagedorn	“ “ “	“
F. W. Jost	“ “ “	“
Chas. M. Semtner	“ “ “	“
Chas. Deickmann	“ “ “	“
Hilmer-Scheitlin Com. Co.	“ “ “	“
Geo. Goener	“ “ “	“
John Lawrence	“ “ State	No appeal

The State will not realize anything on the judgments obtained against F. B. Hunter, George Harris and John Lawrence, mentioned in the above list, as parties against whom the judgment was had. Each one of the parties was forced to suspend business for the lack of money, and they are now working for others. I have seen and talked with each one of the three, and I am convinced that nothing could be realized on the judgments just now. The manufacturer, The Standard Butterine Company, who sold the goods, is now in the hands of a receiver, so no help can be expected from that direction.

Thirty-three cases compromised.

The following cases have, in accordance with the terms of the Board, been settled and dismissed in the circuit court. In each of the following cases the defendant paid the sum of twenty-five dollars and costs of court, viz.:

State of Missouri vs.

Alex McCabe.
J. J. Bowlin.
Jos. Adler.
Ed. Olszewiski.
Hess & Baltezor.
C. A. Timmerberg.
Jas. Barnes.
H. W. Damme.
Wm. Zeltmann.
Hilmer-Scheitlin Com. Co.
Chas. D. Kelting.
N. A. Quigley.
L. R. Manion.
J. B. Ackfeld.
Hy. Vandeloecht.
W. E. Vach.
John Madsten.
Otto Schmidt.
P. J. Ryan.
C. E. Sanner Grocer Co.
A. J. Schramm.
Chas. C. Duemler.
John Petersen et al.
Ed. Eiben.
Chas. Lang.
Will Docter.
F. W. Jost.
Chas. H. Semtner.
Zurheide Bros.
Stocker Bros. Gro. Co.
C. Kuhlmann.
C. Huhlmann.
John P. O'Conor.

In 21 cases an agreement to compromise, on the above terms, has been arrived at in each of the following cases, to-wit:

State of Missouri vs.

William Leownau.
Herman W. Heuman.
Henry W. Meyer.
Fred. Heehs.
Benjamin Surkamp.
H. Bohn Gro. Co.
R. L.Fleming.
Ferdinand D. Mundinger.
George Goener.
Louis Meyer.
Henry Fasterling et al.
John Madsten.
Godfrey Wolfe.
Herman Heumann.
Chas. Deickmann.
George Goener.
Wm. J. Hagedorn.
Anna M. Beckenkord.
Bauer & Budo.
Gus. Klein.
Chas. W. Hilf.

The last named cases will be reached some time in February or March of next year.

The State obtained judgment in the circuit court on an appeal from the justice court against Herman W. Heumann and Wm. Loewnau, in the sum of fifty dollars and costs. The trial of the State vs. Henry W. Meyer resulted in a verdict for the defendant on an incorrect instruction given to the jury by the court against the objection of the State's attorney. The court was convinced of its error, and gave the State a new trial in said case. The case of the State vs. L. F. Meyerhoff was lost to the State. An affidavit for an appeal was made in the last named case; but, it being the opinion of the Board that an appeal had best not be taken, the case was dismissed at the State's cost.

Altogether the number of cases in the circuit court on appeal from the justice court amounts to 67. Thirty-two of this number have already been compromised and an agreement to compromise has been reached in twenty-two, making in effect a disposal of fifty-four of the sixty-seven cases. Thirteen cases remain to be disposed of. Of this number several are execution proof, consequently the prosecution of these worthless cases need not be carried any further. I hope to be able, at an early date, to compromise as many of the thirteen cases as possible.

Respectfully,
Jno. H. Wilkinson,
Inspector of the Missouri State Board of Agriculture.

The Auditing Committee submitted the following report:

REPORT OF AUDITING COMMITTEE.

We, the undersigned Committee authorized to examine vouchers approved by the Executive Committee which are now in the hands of the Secretary and the warrants drawn therefor by the President and Secretary which have been paid, canceled and returned by the Treasurer and compare the same with the financial statement of Secretary and Treasurer, after a careful examination of the same, submit the following report:

FUND—DISTRIBUTION OF ANNUAL REPORT.

We find vouchers 108 and 109 have been approved and corresponding warrants issued which have been paid and canceled by the Treasurer. Balance in fund, 0.00.

FUND—MONTHLY CROP REPORT.

We find that vouchers 244 to 267, inclusive, have been approved and corresponding warrants issued, which have been paid and canceled by the Treasurer. Balance in fund, $132.23.

FUND—EXPENSE OF MEMBERS.

We find that vouchers 453 to 499 have been approved and corresponding warrants issued, which have been paid and canceled by the Treasurer except that warrant No. 486 issued to S. H. Prather for amount of $10, and warrant No. 498 issued to W. C. Howell for amount of $15 have not been presented to the Treasurer for payment. The balance shown in the Secretary's statement is $420.31. The Balance shown in the Treasurer's statement is $445.31. When the above warrants are paid the accounts of the Secretary and Treasurer will correspond.

FUND—OFFICE EXPENSE.

We find that vouchers 404 to 448 have been approved and corresponding warrants issued, which have been paid and canceled by the Treasurer. Balance in fund, $206.49.

FUND—FARMERS' INSTITUTE.

We find that vouchers 480 to 523 have been approved and corresponding warrants issued, which have been paid and canceled by the Treasurer except that warrant No. 494 issued to Swine Breeders' Association for amount of $25 has not been presented to the Treasurer for payment. The balance shown in the Secretary's statement is $654.90. The balance shown in the Treasurer's statement is $679.90. When the above warrant is paid the accounts of the Secretary and Treasurer will correspond.

FUND—SECRETARY'S ACCOUNT.

We have examined the Secretary's account fund and find that the Secretary has received to the credit of said fund $2,829.47. We find accounts filed and corresponding receipts on file for the total amount of $2,657.44, leaving a balance on hand $172.03.

FUND—STATE VETERINARY.

We find that vouchers 1248 to 1347 have been approved and corresponding warrants issued, which have been paid and canceled by the Treasurer except that warrant No. 1341 issued to R. B. Love for amount of $20.00 and warrant No. 1346 issued to Jesse Robards for amount of $134.45 have not been presented to the Treasurer for payment. The balance shown in the Secretary's statement is $1,074.49. The balance shown in the Treasurer's statement is $1,228.94. When the above warrants are paid the accounts of the Secretary and Treasurer will correspond.

FUND—BUTTERINE.

We find that vouchers 362 to 401 have been approved and corresponding warrants issued, which have been paid and canceled by the Treasurer. We find that warrant No. 320 issued May 1st, 1901, to C. G. Miller for the amount of $1 has not been presented for payment, but the Secretary holds a receipt for the warrant. The balance shown in the Secretary's statement is $381.46. The balance shown in the Treasurer's statement is $382.46. When the above warrant is paid or canceled the accounts of the Secretary and Treasurer will correspond.

All of which is respectfully submitted.

W. T. CARRINGTON,
ALEX. MAITLAND,
Auditing Committee.

On motion of Mr. Potts, the report was adopted as submitted.

The Committee on Agricultural College made the following report:

REPORT OF THE AGRICULTURAL COLLEGE COMMITTEE.

Mr. President:

Your Committee after an examination of the Agricultural College and Experiment Station, beg to submit the following report:

1. We are gratified to note that the new dairy building, the new live stock judging building, and the new horticultural building, for which appropriations were made by the last General Assembly, appear to be well adapted to the purposes for which they are intended, that they present a neat and attractive appearance, and we desire to especially commend the action of the authorities in constructing these buildings of native lime-stone instead of brick. They are permanent structures of which any Agricultural College in the country may be justly proud.

2. In our judgment the lines of work undertaken by the Experiment Station in crops, tillage, stock feeding, orcharding, diseases of live stock, combating of injurious insects, etc., are proving of great value in the development of the Agricultural resources of the State and in pointing out the way to more successful systems of farming.

3. We note with pleasure that the work of the Agricultural College has been still further improved, the standards materially raised, and feel certain that this instruction is now upon the same high plane as that of any other subject in University work, and is entitled to the same respect and consideration from the teachers and students of the institution.

4. We commend especially the close and friendly co-operation between the Board of Agriculture and the College and Experiment Station in all matters of mutual interest, such as Farmers' Institute work, promotion of Agricultural Education, suppression of contagious diseases among plants and live-stock, the combating of injurious insects, etc., and trust that these relations may be continued upon the same basis to the benefit of the Agriculture of this commonwealth.

5. The seeking of co-operation on the part of the Federal government with the Missouri Experiment Station, in many of its most important lines of work, is a high compliment to the character of the men connected with the Station and to the lines of work undertaken.

6. We desire to commend the very useful work done heretofore by Dr. Connaway in the diseases of cattle, and the exceedingly valuable work now in progress with reference to the diseases of swine. The importance of this work to the live stock interests of the State we believe justifies and demands that he be provided with trained assistants and laboratories and hospitals entirely adequate for the vigorous prosecution of these investigations. In our judgment the sum of $50,000 should be appropriated for the furtherance of this work. We consider that money cannot be more profitably expended than for the protection of the live stock interests of the State.

7. We find that the buildings for the housing of the live stock of the College are wholly inadequate, are practically worn out and are not at all adapted to the purposes for which they are now used. These buildings when constructed many years ago were perhaps satisfactory, but have long since outlived their usefulness and are now discreditable to the institution and to the State and should be replaced with new and modern structures. For the erection of suitable barns for the housing of the live stock of the College, and for carrying out the experimental work now in progress, we earnestly recommend that the sum of $10,000 be appropriated.

8. We believe that the Agricultural students should be given practical training and experience in operating all classes of modern farm implements and machinery. The manufacturers have offered to donate this machinery and keep it up to date, provided the College will furnish a suitable building where it may be housed and operated. In view of the importance of this work and of the opportunity to secure thousands of dollars worth of equipment, we earnestly recommend that the sum of $4,000 be appropriated for a farm machinery laboratory and for the necessary engine, shafting, belts, etc., for the operation of the same.

9. In order that Missouri may not rank as second in her live stock industry, we recommend an appropriation of $10,000 for providing the necessary facilities for instruction in this important subject. We cannot hope to have our young men excel in this industry without as good facilities for their training as is provided by any state in the Union.

10. The rapid growth and popularity of this branch of the University, renders imperative the demand for more help to rightly care for its work, and for meeting this need we recommend the appropriation of $6,000 for two years.

11. In case the appropriation made for the new buildings is not sufficient to completely equip them with all necessary facilities for instruction and research, we recommend that the Board of Curators request the Legislature to appropriate the money necessary for this purpose.

12. We are glad to note the friendly interest the authorities of the University manifest in the development of the College of Agriculture and Experiment Station, and trust that the teachers and officers of this Department may continue to have their friendly co-operation and support. We earnestly recommend to the Board that they use their best endeavors to secure adequate funds for the further equipment of the College, and for the enlargement of the work of the Experiment Station. We believe that the best investment that the State and the University make is in the practical experimental work conducted by the Station, and that liberal support should be given to this Department of the institution.

13. We believe that a Demonstration Car fitted up by the College will prove to be a valuable feature of the Farmers' Institute work held under the auspices of this Board. We commend this new departure on the part of the Secretary of this Board and the Agricultural College.

14. We recommend that provisions be made for the teaching of Agriculture in the common schools and the graded schools of the State, that steps be taken toward the articulation of this work with the Agricultural College just as the academic courses in our high schools are articulated with the University.

15. We note with pleasure that there are successful efforts put forth to teach Agriculture and Horticulture in the common schools of the State and we find that the University authorities responded to the request made by this Board last year to have bulletins prepared by its professors on these subjects for the teachers.

Believing that the Agricultural College can do much for agriculture through the teachers of the State, we recommend that it provide a Correspondence Department, the principal work of which shall be instructure and examining teachers on the subject matter of these bulletins and to direct teachers in giving instruction in these subjects in the country districts.

We recommend that a committee of three be appointed to bring this matter to the attention of the University Board of Curators and urge upon them to make such provision as is herein recommended.

W. L. Bryant,
W. C. Howell,
C. F. Afflick,
Committee.

ELECTION OF OFFICERS.

The following officers were elected for the ensuing year:

President, F. J. Hess.
Vice-President, C. F. Afflick.
Secretary, Geo. B. Ellis.
Assistant Secretary, Snowdon B. Willis.
Treasurer, H. H. Banks.

The following members of the Executive Committee were elected:

F. J. Hess.
C. F. Afflick.
H. J. Waters.
W. C. Howell.
W. L. Bryant.

Dr. H. J. Waters called up the recommendations which were made by the Executive Committee for amount of moneys needed for the next biennial period, and after a discussion of the same, the action of the Executive Committee was unanimously approved in making the following recommendations:

We recommend to the Legislature that the following amounts will be needed for the next biennial period:

Veterinary Fund	$20,000
Farmers' Institute Fund	10,000
Annual Report Fund	4,000
Distribution of Annual Report Fund	1,000
Office Expense Fund	1,000
Crop Report Fund	2,000
Expense of Members' Fund	1,500
Butterine Fund	4,000

We would further state that we believe the salaries of the Secretary and Assistant Secretary of this Board are inadequate and would recommend an amendment that would give two thousand dollars per annum for Secretary's salary and one thousand per annum for Assistant Secretary. The Secretary is the executive officer of the Board and his duties correspond to those performed by similar departments of other States where the salary is from two thousand to three thousand dollars. The publication of the annual report and the monthly bulletin, collecting crop and live stock statistics, the supervision of the farmers' institute work and the State Veterinary Service requires the entire time of the Secretary. The character of the annual report and the monthly bulletins issued from the Secretary's office has received the most favorable comment by a great number of farmers, both in and out of Missouri, and we can see no reason why the above increase of salaries should not be allowed.

Upon motion of Mr. Maitland, the Board took a recess to permit a meeting of the State Fair Directory.

Board called to order by the President after recess.

Upon motion of Mr. Carrington, the Executive Committee was increased to seven members.

Upon motion of H. J. Waters, W. R. Wilkinson and J. J. Conrad were elected as the additional two members of the Committee.

Board took recess until 8:30 Wednesday morning.

Wednesday, December 17th, 8:30 a. m.

Board met in parlors of Gordon Hotel and in the absence of the President, was called to order by the Vice-President, C. F. Afflick.

DEATH OF JUDGE MARTIN.

Mr. Maitland offered the following resolution:

Whereas, it has pleased Divine Providence to call unto Himself the Dean of the Law School of the University of the State of Missouri; therefore be it

Resolved, that the members of the State Board of Agriculture, now in annual session, recognize the great loss to the State of Missouri by his sudden demise, and they hereby express their deep sympathy with his family and associates in their sad bereavement.

The resolution was unanimously adopted and ordered spread upon the records.

Mr. Bryant moved that all power vested in the full Board be delegated to the Executive Committee, and they are hereby authorized to act for the full Board whenever the full Board is not in session. Motion carried.

There being no further business, the Board adjourned.

FERD J. HESS, GEO. B. ELLIS,
President. Secretary.

SECRETARY'S FINANCIAL STATEMENT.

DISTRIBUTION OF ANNUAL REPORT FUND.

Date.	War. No.	Name.	Dr.	Cr.
1902.				
April 2		To requisition	$150 00	
June 2	108	By American Express Co		$108 72
July 5	109	E. F. Ammerman		41 28
			$150 00	$150 00

MONTHLY CROP REPORT FUND.

Date.	War. No.	Name.	Dr.	Cr.
1901.				
Dec. 3		To balance	$106 12	
1902.				
Jan. 3	244	By H. H. Banks		$5 00
Feb. 1	245	F. O. Sawyer Paper Co		19 17
"	246	S. H. Elkins		16 00
April 2		To requisition	100 00	
"	247	By S. H. Elkins		42 40
"	248	A. B. Dick Co		2 69
"	249	S. H. Elkins		50 00
May 3		To requisition	100 00	
"	250	By J. Manz Engraving Co		6 33
June 2		To requisition	100 00	
"	251	By Missouri Statesman		155 15
"	252	S. H. Elkins		2 70
July 5		To requisition	100 00	
"	253	By S. H. Elkins		1 50
"	254	Missouri Statesman		41 60
"	255	Missouri Statesman		36 60
Aug. 1		To requisition	100 00	
"	256	By Missouri Statesman		54 40
"	257	S. H. Elkins		2 65
"	258	S. H. Elkins		22 40
Sept. 5	259	S. H. Elkins		21 20
"	260	Missouri Statesman		3 00
Oct. 3		To requisition	100 00	
"	261	By Missouri Statesman		38 40
"	262	S. H. Elkins		75
Nov. 6		To requisition	100 00	
"	263	By Missouri Statesman		40 25
"	264	S. H. Elkins		17 90
"	265	S. H. Elkins		38 00
Dec. 6		To requisition	100 00	
"	266	By S. H. Elkins		21 80
"	267	Missouri Statesman		134 00
"		Balance		132 23
			$906 12	$906 12

EXPENSE OF MEMBERS' FUND.

Date.	War. No.	Name.	Dr.	Cr.
1901.				
Dec. 3		To balance	$449 27	
Dec. 18	453	By J. W. Hill		$15 00
"	454	W. T. Carrington		8 20
"	455	C. L. Boisselier		17 35
"	456	C. F. Afflick		10 05
"	457	H. F. Hand		11 60
"	458	W. R. Wilkinson		24 40
"	459	Alex. Maitland		14 50
"	460	F. J. Hess		25 49
"	461	W. C. Howell		17 70
"	462	J. J. McNatt		26 90
"	463	J. A. Potts		4 50
"	464	A. T. Nelson		28 00
"	465	N. H. Gentry		8 30
"	466	J. W. Hill		15 00
1902.				
Jan. 3	467	H. H. Banks		5 00
Feb. 1		To requisition	100 00	
"	468	By Geo. B. Ellis		15 80
Mar. 5	469	H. J. Waters		11 45
"	470	Geo. B. Ellis		11 45
"	471	Wm. C. Howell		16 70
May 3	472	W. L. Bryant		18 25
"	473	W. R. Wilkinson		4 90
"	474	W. C. Howell		15 00
"	475	F. J. Hess		16 16
"	476	Geo. B. Ellis		13 70
"	477	H. J. Waters		10 80
July 5	477½	W. C. Howell		14 00
"	478	Geo. B. Ellis		12 60
"	479	H. J. Waters		13 20
Aug. 1		To requisition	200 00	
"	480	By H. J. Waters		12 70
"	481	Geo. B. Ellis		14 25
Aug. 20	482	Geo. B. Ellis		8 95
"	483	Wm. C. Howell		10 00
"	484	H. F. Hand		8 00
"	485	W. L. Bryant		5 00
"	486	S. H. Prather		10 00
"	487	C. F. Afflick		20 00
"	488	W. T. Carrington		5 00
"	489	F. J. Hess		24 76
Sept. 5	490	A. T. Nelson		13 25
"	491	H. J. Waters		8 30
"	492	Geo. B. Ellis		2 00
"	493	W. L. Bryant		5 00
Oct. 3		To requisition	100 00	
"	494	By W. L. Bryant		5 00
"	495	H. J. Waters		17 30
"	496	Geo. B. Ellis		15 80
Dec. 6		To requisition	200 00	
"	497	By Geo. B. Ellis		13 30
"	498	W. C. Howell		15 00
"	499	H. J. Waters		9 35
"		balance		420 31
			$1,049 27	$1,049 27

OFFICE EXPENSE FUND.

Date.	War. No.	Name.	Dr.	Cr.
1901.				
Dec. 3	....	To balance	$136 34	
1902.				
Jan. 3	404	By Snowdon Willis		$10 00
"	405	W. E. Harshe		2 30
"	406	S. P. Howell		17 95
Feb. 1	407	Snowdon Willis		10 00
"	408	Wabash Railroad		2 29
"	409	S. P. Howell		15 95
March 5	....	To requisition	100 00	
"	410	By Columbia Telephone Co		6 70
"	411	W. E. Harshe		4 10
"	412	S. P. Howell		15 55
"	413	Snowdon Willis		10 00
April 2	414	"		10 00
"	415	American Express Co		1 43
"	416	S. H. Elkins		1 85
"	417	S. P. Howell		16 70
May 3	418	Snowdon Willis		10 00
"	419	S. P. Howell		15 00
"	420	W. E. Harshe		1 75
June 2	421	Snowdon Willis		10 00
"	422	P. A. Luckey		5 45
"	423	S. P. Howell		16 00
July 5	....	To requisition	100 00	
"	424	By W. E. Harshe		2 65
"	425	Snowdon Willis		10 00
"	426	Missouri Statesman		2 50
"	427	"		3 25
"	428	S. P. Howell		17 70
Aug. 1	429	Snowdon Willis		10 00
"	430	S. P. Howell		15 53
"	431	W. E. Harshe		2 25
Sept. 5	432	S. P. Howell		15 45
"	433	Snowdon Willis		10 00
"	434	Columbia Telephone Co		7 45
Oct. 3	....	To requisition	100 00	
"	435	By Snowdon Willis		10 00
"	436	Wabash Railroad Co		2 04
"	437	F. O. Sawyer Paper Co		29 81
"	438	D. A. Luckey		15 55
"	439	W. E. Harshe		2 30
Nov. 6	....	To requisition	100 00	
"	440	By Snowdon Willis		10 00
"	441	Columbia Telephone Co		7 35
"	442	D. A. Luckey		15 78
Dec. 6	....	To requisition	100 00	
"	443	By S. H. Elkins		20 00
"	444	D. A. Luckey		16 24
"	445	University Co-operative Store		1 63
"	446	W. E. Harshe		1 60
"	447	Snowdon Willis		10 00
"	448	Missouri Statesman		7 75
"	....	Balance		206 49
			$636 34	$636 34

FARMERS' INSTITUTE FUND.

Date.	War. No.	Name.	Dr.	Cr.
1901. Dec. 3		To balance	$691 37	
1902. Jan. 3	480	By George B. Ellis		$50 00
"	481	H. H. Banks		25 00
Feb. 1	482	American Express Co		7 21
"	483	George B. Ellis		50 00
"	484	J. Manz Engraving Co		12 16
"	485	Missouri Statesman		74 20
"	486	G. W. Waters		8 75
"	487	S. H. Elkins		3 55
March 5		To requisition	200 00	
"	488	By American Express Co		5 25
"	489	N. F. Murray		35 00
"	490	George B. Ellis		50 00
"	491	Dr. J. W. Connoway		17 34
"	492	Missouri Statesman		103 10
"	493	Road Improvement association		50 00
"	494	Swine Breeders' Association		25 00
April 2		To requisition	200 00	
"	495	By S. H. Elkins		22 40
"	496	Geo. B. Ellis		50 00
"	497	S. H Elkins		50 00
May 3		To requisition	500 00	
"	498	By Tribune Printing Co		110 00
"	499	W. L. Schubert		15 00
"	500	Geo. Wilson Hamilton		25 00
"	501	Wm. Duvalt		15 00
"	502	D. B. Matthews		25 00
"	503	Geo. B. Ellis		50 00
June 2	504	Geo. B. Ellis		50 00
"	505	J. Manz Engraving Co		2 25
"	506	G. W. Waters		88 89
July 5	507	American Express Co		4 43
"	508	Robert B. Harshe		8 50
"	509	S. H. Elkins		20 00
"	510	D. Ward King		85 00
Aug. 1		To requisition	1,000 00	
"	511	By Geo. B. Ellis		50 00
"	512	Geo. B. Ellis		50 00
"	513	H. H. Banks		17 50
Aug. 20	514	Geo. B. Ellis		1,000 00
Sept. 5		To requisition	1,000 00	
"	515	By S. H. Elkins		64 80
"	516	Geo. B. Ellis		50 00
"	517	A. B. Dick Co		2 14
Oct. 3		To requisition	500 00	
"	518	By Geo. B. Ellis		50 00
"	519	Geo. B. Ellis		1,000 00
Nov. 6		To requisition	600 00	
"	520	By Geo. B. Ellis		50 00
"	521	Geo. B. Ellis		500 00
Dec. 6	522	Missouri Statesman		14 00
"	523	Geo. B. Ellis		50 00
"		Balance		654 90
			$4,691 37	$4,691 37

SECRETARY'S ACCOUNT.

Date.		Name.	Dr.	Cr.
1901.				
Dec.	17	To balance	$261 26	
"	17	By S. H. Elkins		$3 00
"	17	J. M. Stedman		11 02
"	17	E. DeLay		5 65
"	21	F. B. Mumford		10 90
"	23	Dr. A. T. Peters		8 80
"	30	S. H. Elkins		8 00
1902.				
Jan.	8	S. H. Elkins		10 00
"	9	Dr. D. F. Luckey		46 92
"	16	Southern Printers' Supply Co		4 16
"	16	New York Engraving and Printing Co		4 50
"	16	J. Manz Engraving Co		2 87
"	21	S. H. Elkins (money order)		61
"	21	J. B. Lippincott Co		5 30
"	21	C. M. Cooper & Co		2 00
"	23	G. W. Waters		34 20
"	24	S. H. Elkins		10 00
"	29	C. H. Eckles		10 00
"	30	S. H. Elkins		25 00
Feb.	8	J. Manz Engraving Co		31 12
"	26	S. H. Elkins		1 53
"	26	J. Manz Engraving Co		13 34
"	28	S. H. Elkins		3 05
March	5	"		6 00
"	6	"		4 29
"	11	To deposit by George B. Ellis	1 00	
August	23	Warrant No. 514 on Farmers' Institute Fund	1,000 00	
"	28	By C. D. Lyon		50 00
"	28	George W. Waters		50 00
"	28	Euclid N. Cobb		50 00
"	28	D. F. Luckey		50 00
Sept.	2	H. J. Waters		19 89
"	4	N. F. Murray		41 30
"	9	Euclid N. Cobb		42 40
"	9	G. W. Waters		50 00
"	9	C. D. Lyon		50 00
"	16	C. H. Eckles		50 00
"	17	G. M. Tucker		50 00
"	18	J. C. Whitten		25 70
"	22	F. B. Mumford		23 39
"	22	G. W. Waters		50 00
"	23	F. S. Webster & Co		4 30
"	26	D. F. Luckey		50 00
Oct.	2	W. D. McKee		42 32
"	2	Dr. A. J. Detweiler		25 50
"	2	G. M. Tucker		10 00
"	3	To Warrant No. 519 on Farmers' Institute Fund	1,000 00	
"	3	By H. J. Waters		21 61
"	6	G. W. Waters		130 00
"	13	F. B. Mumford		27 61
"	13	N. F. Murray		93 41
"	13	S. A. Hoover		24 80
"	13	D. Ward King		96 11
"	13	T. E. Orr		175 84
"	13	C. D. Lyon		123 65
"	13	J. T. Stinson		17 50
"	14	J. C. Whitten		50 20
"	18	W. P. Harned		51 00
"	23	S. H. Elkins		1 53
Nov.	6	To Warrant No. 521 on Farmers' Institute Fund	500 00	
"	6	By G. W. Waters		50 00
"	6	R. C. Moore		38 20
"	6	John R. Kirk		7 40
"	14	W. L. Howard		20 86
"	15	D. Ward King		30 00
"	18	N. F. Murray		50 00
"	22	To refund from Burlington Railroad half fare Institute lecturers	37 21	
"	24	By A. J. Detweiler		43 15
"	24	J. C. Whitten		32 48
"	26	M. Butterfield		20 73
"	26	N. F. Murray		46 55
"	28	J. M. Price		11 60
"	28	W. L. Howard		26 47
"	28	Dr. T. E. White		88 33
"	28	G. W. Waters		77 20
"	29	R. W. Clothier		40 00
"	29	"		16 80
"	29	D. Ward King		83 24

SECRETARY'S ACCOUNT—Continued.

Date.		Name.	Dr	Cr.
Dec.	3	George W. Williams		$75 90
"	3	S. H. Elkins		5 00
"	4	G. M. Tucker		6 44
"	4	"		1 57
"	5	J. Manz Engraving Co		14 03
"	9	C. H. Eckles		11 17
"	9	"		50 00
"	12	To refund from D. Ward King	$30 00	
"	12	By balance		172 03
			$2,829 47	$2,829 47

BUTTERINE FUND.

Date.		War. No.	Name.	Dr.	Cr.
1901.					
Dec.	3		To balance	$286 66	
1902.					
Jan.	3		To requisition	200 00	
"		362	By Frank Yeoman		$55 00
"		363	C. A. McCrum		1 00
"		364	G. Hinrich		15 00
"		365	John H. Wilkinson		59 15
"		366	C. Humphrey		5 00
"		367	H. H. Banks		15 00
Feb.	1		To requisition	200 00	
"		368	By R. D. Ellis		111 50
"		369	Frank Yeoman		58 75
Mar.	5		To requisition	200 00	
"		370	By John H. Wilkinson		62 65
"		371	J. W. Carter		35 00
"		372	John H. Wilkinson		48 00
Apr.	2		To requisition	200 00	
"		373	By S. H. Elkins		10 96
"		374	Frank Yeoman		51 15
"		375	Carl G. Hinrichs		98 00
"		376	Frank Yeoman		53 00
"		377	R. D. Ellis		90 00
"		378	John H. Wilkinson		52 00
May	3		To requisition	200 00	
"		379	By J. W. Carter		25 00
"		380	Frank Yeoman		54 50
"		381	John H. Wilkinson		53 30
"		382	John H. Wilkinson		37 80
"		383	C. Humphreys		20 00
"		384	W. R. Wilkinson		50 00
June	2		To requisition	500 00	
"		385	By R. D. Ellis		162 00
"		386	Carl G. Hinrichs		82 00
"		387	John H. Wilkinson		55 60
"		388	Frank Yeoman		54 00
July	5	389	J. W. Carter		15 00
"		390	Frank Yeoman		52 50
"		391	Smith Premier Typewriter Co		3 25
"		392	John H. Wilkinson		53 20
Aug.	1		To requisition	200 00	
"		393	By Frank Yeoman		54 00
"		394	H. H. Banks		7 50
"		395	John H. Wilkinson		56 35
Sept.	5	396	Frank Yeoman		54 00
"		397	John H. Wilkinson		54 75
Nov.	6		To requisition	200 00	
"		398	By Frank Yeoman		30 00
"		399	John H. Wilkinson		108 25
"		400	R. D. Ellis		48 00
Dec.	6		To requisition	200 00	
"		401	By J. H. Wilkinson		53 10
"			Balance		381 36
				$2,386 66	$2,386 66

STATE VETERINARY FUND.

Date.	War. No.	Name.	Dr.	Cr.
1901.				
Dec. 3		To balance	$377 30	
1902.				
Jan. 3		To requisition	1,000 00	
"	1248	By Minnie Lee Blackwell		$50 00
"	1249	F. W. O'Brien		21 70
"	1250	E. M. Hendy		18 30
"	1251	Ev. E. Carreras		2 50
"	1252	E. F. Ammerman		6 00
"	1253	B. F. Milstead		104 55
"	1254	Geo. H. Boughner		25 00
"	1255	Joseph Bruser		25 00
"	1256	John Forbes		25 00
"	1257	H. H. Banks		50 00
Feb. 1		To requisition	500 00	
"	1258	By Minnie Lee Blackwell		50 00
"	1259	E. M, Hendy		14 40
"	1260	Jesse Robards		125 00
"	1261	Geo. H. Boughner		25 00
"	1262	Joseph Bruser		25 00
"	1263	John Forbes		25 00
"	1264	D. F. Luckey		416 54
"	1265	E. Brainerd		16 96
Mar. 5		To requisition	1,000 00	
"	1266	By R. C. Moore		26 00
"	1267	Dr. E. J. Netherton		175 47
"	1268	Jesse Robards		244 11
"	1269	E. F. Ammerman		13 31
"	1270	Minnie Lee Blackwell		50 00
"	1271	B. F. Milstead		202 00
"	1272	S. H. Elkins		10 60
"	1273	D. F. Luckey		231 07
Apr. 2		To requisition	500 00	
"	1274	By S. H. Elkins		42 40
"	1275	Jesse Robards		127 70
"	1276	Minnie Lee Blackwell		50 00
"	1277	E. W. Stephens		15 00
"	1278	F. W. O'Brien		13 60
"	1279	B. F. Milstead		112 15
"	1280	E. M. Hendy		11 65
"	1281	F. O. Sawyer Paper Co.		5 57
"	1282	N. H. Gentry		29 45
"	1283	D. F. Luckey		269 61
"	1284	E. F. Ammerman		2 10
"	1285	S. H. Elkins		50 00
May 3		To requisition	500 00	
"	1286	By Minnie Lee Blackwell		50 00
"	1287	M. K. & T. R. R.		2 14
"	1288	D. F. Luckey		178 48
"	1289	Jesse Robards		132 03
"	1290	F. W. O'Brien		19 35
"	1291	S. H. Elkins		50 00
June 2	1292	M. L. Blackwell		50 00
"	1293	R. C. Moore		26 00
"	1294	Wyckoff, Seamens & Benedict		7 00
"	1295	B. F. Milstead		30 00
"	1296	McAlester Lumber Co.		5 75
"	1297	F. O. Sawyer Paper Co.		4 36
"	1298	D. F. Luckey		150 00
"	1299	Columbia Telephone Co.		9 55
"	1300	M. K. & T. R. R.		15 79
"	1301	D. F. Luckey		68 21
"	1302	R. C. Moore		13 00
"	1303	F. W. O'Brien		10 30
July 5		To requisition	1,000 00	
"	1304	By E. F. Ammerman		70 83
"	1305	Lyman D. Brown		46 65
"	1306	R. C. Moore		36 00
July 5	1307	By D. F. Luckey		219 17
"	1308	Jesse Robards		134 50
"	1309	S. H. Elkins		40 00
"	1310	Jesse Robards		126 00
"	1311	Minnie Lee Blackwell		50 00
Aug. 1		To requisition	1,000 00	
"	1312	By D. F. Luckey		232 75
"	1313	Jesse Robards		147 85
"	1314	American Express Co.		5 20
"	1315	Dr. J. W. Connoway		19 84
"	1316	M. L. Blackwell		50 00
"	1317	H. H. Banks		25 00

STATE VETERINARY FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
Sept. 5	....	To requisition	$500 00	
"	1318	By Minnie Lee Blackwell		250 00
"	1319	S. H. Elkins		21 20
"	1320	Missouri Statesman		44 10
"	1321	D. F. Luckey		196 03
"	1322	Jesse Robards		144 10
"	1323	E. F. Ammerman		8 76
"	1324	R. B. Love		213 45
"	1325	S. H. Elkins		1 35
"	1326	R. C. Moore		217 62
Oct. 3	....	To requisition	500 00	
"	1327	By Jesse Robards		127 40
"	1328	Pacific Express Co.		11 37
"	1329	R. C. Moore		92 05
"	1330	R. B. Love		149 00
"	1331	F. W. O'Brien		6 80
"	1332	D. F. Luckey		150 00
Nov. 6	....	To requisition	1,000 00	
"	1333	By D. F. Luckey		327 98
"	1334	R. B. Love		5 75
"	1335	R. C. Moore		86 45
"	1336	Jesse Robards		149 85
"	1337	F. W. O'Brien		21 18
"	1338	Lyman D. Brown		84 85
"	1339	Nora K. Hall		11 00
"	1340	Minnie Lee Blackwell		8 33
Dec. 6	....	To requisition	600 00	
"	1341	By R. B. Love		20 00
"	1342	Nora K. Hall		41 00
"	1343	E. F. Ammerman		8 18
"	1344	R. C. Moore		59 35
"	1345	Missouri Statesman		6 00
"	1346	Jesse Robards		134 45
"	1347	D. F. Luckey		271 42
"	....	Balance		1,074 49
			$8,477 30	$8,477 30

SUMMARY OF FINANCIAL STATEMENT.

Distribution of Annual Report Fund.

1902.		Dr.	Cr.
Jan. 1....	To balance on appropriation	$150 00	
	By vouchers paid		$150 00
		$150 00	$150 00

Monthly Crop Report Fund.

1902.		Dr.	Cr.
Jan. 1....	To balance	$106 12	
"	balance on appropriation	800 00	
	By vouchers paid		$773 89
Dec. 6 ...	balance with our treasurer		132 23
		$906 12	$906 12

Expense of Members' Fund.

1902.		Dr.	Cr.
Jan. 1....	To balance	$499 27	
"	balance on appropriation	600 00	
	By vouchers paid		$628 96
Dec. 6 ...	balance with our treasurer		420 31
		$1,049 27	$1,049 27

Office Expense Fund

1902.		Dr.	Cr.
Jan. 1....	To balance	$136 34	
"	balance on appropriation	500 00	
	By vouchers paid		$429 85
Dec. 6....	balance with our treasurer		206 49
		$636 34	$636 34

Farmers' Institute Fund.

1902.		Dr.	Cr.
Jan. 1....	To balance	$691 37	
" ...	balance on appropriation	4,000 00	
	By vouchers paid		$4,036 47
Dec. 6....	balance with our treasurer		654 90
		$4,691 37	$4,691 37

State Veterinary Fund.

1902.		Dr.	Cr.
Jan. 1.. .	To balance	$377 30	
"	balance on appropriation	8,100 00	
	By vouchers paid		$7,402 [illegible]
Dec. 6....	balance with our treasurer		1,074 [illegible]
		$8,477 30	$8,477 30

Butterine Fund.

1902.		Dr.	Cr.
Jan. 1....	To balance	$286 66	
"	balance on appropriation	2,100 00	
	By vouchers paid		$2,005 20
Dec. 6....	balance with our treasurer		381 46
		$2,386 66	$2,386 66

TREASURER'S REPORT.

To the State Board of Agriculture:

Distribution of Annual Report Fund.

Date.		Dr.	Cr.
1902.			
April 2	To State warrant	$150 00	
	By vouchers paid and returned		$150 00
		$150 00	$150 00

Monthly Crop Report Fund.

1902.			
Jan. 1	To balance	$106 12	
April 2	State warrant	100 00	
May 3	"	100 00	
June 2	"	100 00	
July 3	"	100 00	
Aug. 1	"	100 00	
Oct. 3	"	100 00	
Nov. 6	"	100 00	
Dec. 6	"	100 00	
	By vouchers paid and returned		$773 89
Dec. 6	balance		132 23
		$906 12	$906 12

Expense of Members' Fund.

1902.			
Jan. 1	To balance	$449 27	
Feb. 1	State warrant	100 00	
Aug. 1	"	200 00	
Oct. 3	"	100 00	
Dec. 6	"	200 00	
	By vouchers paid and returned		$628 96
Dec. 6	balance		420 31
		$1,049 27	$1,049 27

Office Expense Fund.

1902.			
Jan. 1	To balance	$136 34	
Mch. 5	State warrant	100 00	
July 5	"	100 00	
Oct. 3	"	100 00	
Nov. 6	"	100 00	
Dec. 6	"	100 00	
	By vouchers paid and returned		$429 85
	balance		206 49
		$636 34	$636 34

Farmers' Institute Fund.

Date.		Dr.	Cr.
1902.			
Jan. 1	To balance	$691 37	
Mch. 5	State warrant	200 00	
April 2	“	200 00	
May 3	“	500 00	
Aug. 1	“	1,000 00	
Sept. 5	“	1,000 00	
Oct. 3	“	500 00	
Nov. 6	“	600 00	
Dec. 6	By vouchers paid and returned		$4,036 47
	balance		654 90
		$4,691 37	$4,691 37

SECRETARY'S ACCOUNT.

1901.			
Dec. 17	To balance	$261 26	
1902.			
Mar. 11	deposit by Geo. B. Ellis	1 00	
Aug. 23	warrant No. 514 on farmers' institute fund	1,000 00	
Oct. 3	wrrrant No. 519 on farmers' institute fund	1,000 00	
Nov. 6	warrant No. 521 on farmers' institute fund	500 00	
Nov. 22	refund from Burlington R. R. half fare ins. lecturers.	37 21	
Dec. 12	refund from D. Ward King	30 00	
	By checks paid and returned		$2,657 44
Dec. 16	balance		172 03
		$2,829 47	$2,829 47

State Veterinary Fund.

1902.			
Jan. 1	To balance	$377 30	
Jan. 3	State warrant	1,000 00	
Feb. 1	“	500 00	
Mar. 5	“	1,000 00	
April 2	“	500 00	
May 3	“	500 00	
July 5	“	1,000 00	
Aug. 1	“	1,000 00	
Sept. 5	“	500 00	
Oct. 3	“	500 00	
Nov. 6	“	1,000 00	
Dec. 6	“	600 00	
	By vouchers paid and returned		$7,402 81
Dec. 6	balance		1,074 49
		$8,477 30	$8,477 30

Butterine Fund.

Date.		Dr.	Cr.
1902.			
Jan. 1....	To balance	$286 66	
Jan. 3....	State warrant	200 00	
Feb. 1....	"	200 00	
Mar. 5....	"	200 00	
April 2....	"	200 00	
May 3...	"	200 00	
June 2....	"	500 00	
Aug. 1. ..	"	200 00	
Nov. 6....	"	200 00	
Dec. 6....	"	200 00	
	By vouchers paid		$2,005 20
Dec. 6. ..	balance.		381 46
		$2,386 66	$2,386 66

Respectfully submitted,
H. H. Banks,
Treasurer.

A REVIEW OF THE WEATHER AND CROP CONDITIONS OF THE YEAR 1902—BY MONTHS.

(From the Annual Summary of the Missouri Section, Climate and Crop Service of the U. S. Weather Bureau, A. E. Hackett, Director.)

JANUARY.—Up to the 20th the month of January, 1902, was exceptionally mild and pleasant, the temperature averaging from 5 to over 10 degrees per day above the normal, but during the last decade the weather was cold and stormy. A prominent feature of the month was the cold wave which overspread the State on the 26th, causing a very rapid fall in termperature, in some localities exceeding 40 degrees in 24 hours. The mean temperature of the month for the State was 30.1 degrees, which is practically normal. The highest local monthly means, 36.0 degrees, occurred at Gayoso, and the lowest, 24.8 degrees, at Maryville. The highest temperature recorded during the month was 72 degrees, at Dean and Potosi, on the 9th, and lowest, 32 degrees below zero, at Bethany, on the 27th. The average number of days with minimum temperature below 32 degrees was 27. Over a few of the extreme southeastern counties, and also in a few localities in the southwest section, the precipitation of the month, practically all of which fell during the last twelve days, was slighty in excess of the normal, but over a large portion of the State there was a marked deficiency, many of the northern and western counties receiving less than 1 inch. The average precipitation for the State was 1.23 inches, or 0.81 inch below the normal. The greatest local monthly precipitation was 6.31 inches, at Gayoso, and the least, .28 inch, at Sarcoxie. The snowfall of the month ranged from 10 to 14 inches over portions of the central and northern sections, but over most of the southern counties it did not exceed 2 inches. During the first 19 days of the month there was practically no precipitation, and, the ground being bare, wheat suffered to some extent from both drouth and freezing, but as a rule the damage was not great. In many of the western counties the condition of the crop was much above the average. During the last ten days of the month frequent snows afforded ample protection, except in portions of the southern sections, where the precipitation was in the form of rain and sleet, which covered the fields with a heavy coating of ice. Stock water continued very scarce in places, and in some counties there was complaint of a scarcity of feed. In the central and southern sections considerable plowing was done during the fore part of the month.

FEBRUARY.—The month of February averaged decidedly colder than usual throughout the State, the deficiency in temperature ranging from 5 degrees in the northwest section to 7 degrees in the central and southwest sections. The coldest period was from the 2d to the 5th, when the daily mean temperatures ranged from 18 to 25 degrees below the normal. The mean temperature of the month for the State was 24.0 degrees, 5.9 degrees below the normal. The highest local monthly mean, 31.6 degrees, occurred at Gayoso, and the lowest, 18.6 degrees, at Maryville. The highest temperature recorded during the month was 72 degrees, at Gayoso, on the 28th, and the lowest, 17 degrees below zero, at Fulton, on the 3d, and Montreal on the 15th. The average number of days with minimum temperature below 32 degrees was 25. Over the greater part of the southwest section and the southern counties of the southeast section the precipitation of the month ranged from 2 to over 3 inches, exceeding the normal over a considerable portion of the southwest section, but over the northern portion of the State it was unusually light, most of the northern counties receiving less than 1 inch. The average precipitation for the State was 1.50 inches, or 0.72 inch below the normal. The greatest local monthly precipitation was 3.17 inches, at Mt. Vernon, and the least, .14 inch, at St. Joseph. Over the northern portion of the State the snowfall was also unusually light, few stations reporting a total of more than 3 inches, but over nearly all of the southwest section and the southern counties of the southeast section it was exceptionally heavy, the total for the month ranging from 8 to 15 inches. Over the larger portion of the State the ground was well covered with snow until the 22d, and in some sections during the entire month, affording ample protection to winter wheat, which was generally reported in good condition, except in some of the southern counties and in a few localities in the northeast section. The melting snows, together with the moderately heavy rains which fell in the southern and eastern sections on the 27th and 28th, materially increased the supply of stock water in those sections, and in some counties streams and ponds were filled to overflowing.

MARCH.—The mean temperature of March, for the State, was 45.3 degrees, or 3.5 degrees above the normal. Unseasonably cold weather prevailed on the 17th and 18th, the temperature falling to near zero in portions of the central and northern sections, but during the greater part of the month the weather was quite mild. The highest local monthly mean, 50.8 degrees, occurred at Gayoso, and the lowest, 40.0 degrees, at Maryville. The highest temperature recorded was 85 degrees, at DeSoto on the 10th, and the lowest, 1 degree, at Maryville and Conception on the 17th. The average number of days with minimum temperature below 32 degrees was 10. Over many of the northern counties, and also over the southern portion of the southeast section, the precipitation was considerably below the normal amount, some localities in the northwest section receiving less than 1 inch, but over nearly all of the east-central, central and southwestern counties there was an excess, a majority of those counties south of the Missouri river receiving from 4 to over 6 inches. The average precipitation for the State was 3.49 inches, 0.11 inch above the normal. The greatest local monthly precipitation was 7.67 inches, at Mt. Vernon, and the least, .46 inch, at St. Joseph. A heavy fall of very wet snow occurred over portions of the central and western sections on the 29th, but elsewhere very little snow fell during the month. Except in some of the southern counties, where heavy rains kept the ground too wet to work, the weather was generally favorable for farming operations and for the growth of grains and grasses. Although in some of the northern counties the precipitation was exceptionally light, there was generally sufficient for the time being, though a considerable portion of the State did not receive enough to thoroughly saturate the subsoil. In a majority of the central and northern, and also in many of the southern counties, the bulk of the oat crop was sown, with the soil in good condition, but in portions of the southern sections the ground was too wet for seeding. In some districts the acreage was considerably reduced owing to the scarcity and high price of seed. Considerable gardening was done, many early potatoes were planted, and much plowing done for corn. In a few of the central and western counties a little corn was planted. Some flax was sown in the southwestern, and a few melons were planted in the southeastern counties. In a few localities in the northern and eastern sections wheat suffered to some extent from lack of moisture, but in most counties the crop was reported as looking well, and in many its condition was much above the average. Clover was reported in good condition in some localities, but in many counties it was almost completely killed out by the drouth of 1901. Grasses started well, as a rule, and in some districts afforded considerable feed by the close of the month. In some of the extreme southern counties early peaches were in bloom at the close of the month and promised a good crop, but elsewhere practically all of the buds had been killed.

April.—From April 1st to 17th cool weather prevailed throughout the State, with frequent frosts, but during the last decade of the month the days were much warmer, though the nights continued cool. The month, as a whole, averaged slightly cooler than usual, the mean temperature for the State being 53.9 degrees, or 1.5 degrees below the normal. The highest local monthly mean, 59.8 degrees, occurred at Gayoso, and the lowest, 50.0 degrees, at Maryville. The highest temperature recorded was 95 degrees, at Oregon on the 20th, and the lowest, 19 degrees, at Edwards on the 8th. The average number of days with minimum temperature below 32 degrees was 2 in the southwest section, 3 in the southeast section, and 5 in the central and northern sections. The precipitation of the month, the greater part of which fell during the last decade, was unevenly distributed and generally deficient. Over small areas in the southern and central sections the total for the month ranged from 4 to over 6 inches, but many of the northern and western counties received less than 2 inches, and in some localities there was less than 1 inch. The average precipitation for the State was 2.66 inches, or 0.98 inch below the normal. The greatest local monthly precipitation was 7.13 inches at Eldon, and the least .72 inch at Maryville. A light fall of snow occurred over portions of the northern sections on the 3d, the greatest depth, 3.0 inches, being reported at Fairport. The weather during April was exceptionally favorable for the rapid progress of farm work, but the low temperature and deficient precipitation greatly retarded the growth of vegetation. During the last decade of the month, however, the weather became warmer, and good showers fell in most sections, resulting in a marked improvement in the condition of all growing crops, although in portions of the northern sections, where the rainfall was lightest, high, drying winds offset to a considerable extent the good effects of the increased warmth and moisture. Very heavy rains occurred in some of the central and southern counties on the 25th, 29th and 30th, washing corn fields badly, and wind and hailstorms did considerable damage to fruit and gardens in some localities. Frosts were of frequent occurrence up to the 19th, but no serious damage resulted, vegetation not being advanced sufficiently to be injured. Oat sowing was practically completed by the 10th, early gardens were made and potatoes planted, and corn planting progressed favorably with the soil in good condition. Some farmers delayed planting for a time waiting for warmer weather, but by the close of the month the work was well advanced in all sections. Germination was slow, owing to the coldness of the ground, but by the 30th considerable corn was up and cultivation had commenced. Flax was about all sown in the southwestern counties by the 15th, and generally came up well, and cotton planting progressed favorably in the extreme southeastern counties. Wheat and oats in the northern sections suffered from lack of moisture during the middle of the month, and were also damaged to some extent by high winds, but were revived by the showers during the last decade, except in some of the extreme northwestern counties, where the rainfall was too light to be of material benefit. In most of the central and southern counties wheat continued in an exceptionally promising condition, and oats did fairly well, though their growth was retarded by the cool weather. Rye also did well and was heading by the close of the month. Owing to the cool, dry weather, grasses were generally backward, especially in the central and northern sections, where pastures afforded but little grazing, and stock water continued very scarce in some of the northern counties. Gardens were also backward, as a rule. Cherry, pear and plum trees bloomed profusely in most sections, and apples also gave promise of a fair to good crop, except in some of the southern counties. In some of the extreme southern counties a good peach crop was promised.

MAY.—The mean temperature of May, for the State, was 69.4 degrees, or 4.3 degrees above the normal. From the 26th to the 30th the weather was quite cool, light frosts occurring in some localities on the 28th, but during the remainder of the month the temperature was almost continuously above the normal. The highest local monthly mean, 74.1 degrees, occurred at Poplar Bluff, and the lowest, 65.0 degrees, at Maryville. The highest temperature recorded was 98 degrees, at Poplar Bluff on the 25th, and the lowest, 39 degrees, at Ironton and Potosi on the 28th. Over the greater portion of the northwest and a considerable portion of the southwest section the precipitation of the month exceeded the normal by from 1 to over 4 inches, a number of stations in those sections reporting a total fall of from 6 to over 9 inches, while over the greater part of the central and eastern sections there was a deficiency, portions of the southeast section receiving less than half the usual amount. The average precipitation for the State was 5.03 inches, which is practically normal. The greatest local monthly fall was 9.93 inches, at Wheatland, and the least, 1.64 inches, at Marble Hill. Except in a few of the northern and eastern counties, where the deficiency in precipitation retarded the growth of oats, pastures and meadows, the weather conditions during May, were, on the whole, very favorable to the farmer. Excessive rains in some localities washed out considerable corn and flooded bottom lands along the smaller streams, but the loss was insignificant compared with the incalculable benefits resulting from the increase of moisture in the soil and filling of ponds and streams. The temperature was generally favorable for plant growth, and, except in the few localities where the rainfall was markedly deficient, all crops made rapid progress. Light frost occurred in some localities in the northern sections on the 7th and 28th, but did no damage. While there was some loss by hailstorms in a few counties, destructive local storms were less frequent than usual. Corn came up to good stands and made good progress, though in some of the central and western counties cultivation was retarded by rains during the latter part of the month and many fields became quite weedy. In many of the northern counties cut worms were destructive, especially on sod ground, necessitating considerable replanting. Cotton, in the southeastern counties, did well, as did also flax in the southwestern counties, except in a few localities. Good rains in the northwestern counties during the first week of the month caused a marked improvement in the wheat crop in that section and throughout the State the crop continued unusually promising, although there was some complaint of rust and lodging in the central and southern sections. Rye also did finely. Oats, as a rule, made good growth and were heading by the close of the month. In some of the northern, central and eastern counties the growth of grasses was retarded by lack of moisture during a part of the month, but toward the close there was a rapid improvement, though many of the old meadows were reported very weedy. Millet and sorghum did well, and gardens and potatoes were very fine. The outlook for the apple crop, however, was not encouraging. In many of the central and northern counties orchards that were not sprayed were defoliated by caterpillars, and during the latter part of the month there was considerable complaint of dropping.

JUNE.—Except in the southern portions of the State the month of June averaged decidedly cooler than usual, the deficiency in temperature being most marked in the northwest section, where it was about 5 degrees. During the first halt of the month the temperature was generally above the normal, but during the latter half the weather was unseasonably cool, remarkably low temperatures for the last decade of June being recorded on the 22d, with light frosts in localities in the northern and eastern sections. The mean temperature of the month for the State, 70.9 degrees, is, with one exception (70.7 degrees in 1889), the lowest June mean recorded during the past fifteen years, and at Oregon, Holt county, it was the coolest June during the past forty-seven years. The highest monthly mean, 75.4 degrees, occurred at Poplar Bluff, and the lowest, 65.4 degrees, at Conception. The highest temperature recorded was 100 degrees, at St. Charles on the 11th, and the lowest, 37 degrees, at Edwards on the 22d. The average number of days with maximum temperature above 90 degrees was 5. In a number of the west-central counties, and also in a few of the extreme southeastern counties, the precipitation was deficient, but over much the greater portion of the State there was a marked excess. The heaviest rains occurred in portions of the central and southwest sections and along the northern border of the State, the total for the month in those districts ranging from 8 to over 12 inches, or from 4 to 8 inches in excess of the normal. The average precipitation for the State was 6.57 inches, 1.70 inches in excess of the normal. The greatest local monthly precipitation was 12.55 inches, at Mt. Vernon, and the least, 2.55 inches, at Lamonte. At Princeton 6.08 inches fell in nine hours and five minutes on the 27-28th. The unseasonably low temperature during the latter part of the month checked the growth of corn and cotton to some extent, and heavy rains during the last week seriously interfered with wheat harvest and caused some damage to grain in shock, while excessive rains in localities resulted in the total loss of some wheat, and considerable damage to other crops on bottom lands by the overflowing of streams. The heavy rains also damaged oats considerably in some places, beating them down so that they could not be cut with binders. In a few of the eastern counties drouth conditions prevailed until the 19th, retarding the growth of all crops to a greater or less extent, but during the last decade of the month that section was visited by copious rains, and the condition of crops was much improved. On the whole, however, the month was favorable and the general outlook most encouraging. The greater part of the corn crop was laid by in excellent condition, and cotton, in the southeastern counties, also did well. Wheat harvest began in the southern sections about the 10th, and was practically finished by the close of the month, except in a few of the extreme northern counties. The heads were generally well filled and the crop promised to be the largest ever grown in the State. Rye was also an excellent crop. In a few of the eastern counties oats suffered somewhat from lack of moisture during the middle of the month, but, in general, they did well until the heavy rains of the last week caused them to lodge badly. Cutting was begun in the extreme southern counties about the 15th, but was retarded by rains. Meadows improved steadily throughout the month, and at the close a good yield was indicated in most sections. Pastures were excellent. Flax, in the southwestern counties, was reported in poor condition in localities, but in general did fairly well, as did also melons in the southeastern counties. Potatoes and gardens were exceptionally fine, and sorghum, millet and cow peas made good growth. Peaches did well in the extreme southern counties, and shipments began about the 25th, but the apple crop continued to decline until at the close of the month less than half a crop was expected.

JULY.—As regards temperature the month of July was unusually pleasant; the mean temperature for the State, 77.0 degrees, was practically normal, and there were comparatively few days with maximum temperature above 90 degrees. The highest local monthly mean, 80.3 degrees, occurred at St. Louis, and the lowest, 73.6 degrees, at Conception. The highest temperature recorded during the month was 103 degrees, at Poplar Bluff on the 15th, and the lowest, 50 degrees, at Potosi on the 21st. The average number of days with maximum temperature above 90 degrees ranged from 16 in the southeast section to 5 in the northwest section, the average for the State being 9. The precipitation of the month was very unevenly distributed, being exceptionally heavy over many of the central and northern counties, while in the southern sections there was a marked deficiency. Over nearly all of the northwest section, the northern portion of the central section and a number of counties in the southwest section the total precipitation for the month exceeded 6 inches, and in a few localities it even exceeded 8 inches, while over a considerable portion of the southeast section there was less than 2 inches, the extreme southeastern counties receiving less than one-half inch. The average precipitation for the State was 4.59 inches, 0.40 inch above the normal. The greatest local monthly precipitation was 10.77 inches, at Oregon, and the least, .15 inch, at Caruthersville. The heavy rains in portions of the northern, central and western sections retarded threshing, oat harvest and haying to a considerable extent during the forepart of the month, and in some districts wheat in shock sprouted badly and oats were beaten down so that a portion of the crop was lost, but in most sections wheat that was well shocked suffered but little damage, and the bulk of the oat crop was secured in good condition. Some hay was damaged in a few of the northern and western counties, but in general an excellent crop was secured in good condition. The yield of wheat proved to be even better than was expected, and notwithstanding the unfavorable weather conditions during harvest, the crop of 1902 goes on record as the largest ever grown in the State. In a few of the extreme southeastern counties, where the rainfall was lightest, corn was seriously injured by drouth, and along the Missouri and Mississippi rivers, and also on some of the smaller streams in the northern part of the State considerable loss was caused by floods, but elsewhere the crop made excellent progress throughout the month. Early corn was in the roasting ear stage by the 25th, and at the close of the month the largest crop in the history of the State was indicated. Flax, in the southwestern counties, proved to be a poor crop, being poorly filled and weedy, but tobacco, cow peas, sorghum, kaffir corn and millet made excellent growth. Cotton, in the southeastern counties, suffered considerably from drouth and there was much complaint of shedding. The melon crop in that section was also damaged, gardens dried up, pastures became short in localities and there was complaint of a scarcity of stock water, but elsewhere garden vegetables were abundant, and pastures continued in excellent condition. Early potatoes were an exceptionally good crop but rotted considerably in some places. Apples continued to drop to some extent, but what remained on the trees promised to be of fine quality. An excellent crop of peaches was gathered in some of the extreme southern counties. Plowing for fall seeding was in progress during the last week of the month, but in many of the southern counties the ground was reported quite hard.

AUGUST.—The month of August averaged somewhat cooler than usual in the central and northern portions of the State, but in the southern sections the mean temperature was practically normal. The mean temperature of the month for the State was 75.0 degrees, 1.2 degrees below the normal. The highest local monthly mean, 80.3 degrees. occurred at Joplin, and the lowest, 71.2 degrees, at Monroe City. The highest temperature recorded was 103 degrees, at Marble Hill on the 3d, and the lowest, 47 degrees, at Ironton and Potosi on the 7th, and Maryville, Bethany, Kidder, and Sublett on the 11th. The average number of days with maximum temperature above 90 degrees ranged from 7 in the northwest section to 14 in the southwest, the average for the State being 9. The precipitation exceeded the normal over practically the entire State and in portions of the central and western sections was remarkably heavy, the total fall ranging from 8 to over 11 inches. In portions of the southeast section drouth conditions prevailed until the 26th, but on the 26th and 27th that section was visited by heavy showers, the rainfall in some localities being sufficiently heavy to cause damaging floods. The average precipitation for the State was 6.16 inches, or 3.01 inches above the normal. The greatest local monthly fall was 11.49 inches, at Arthur, and the least, .96 inch, at Galena. Except in a few districts where the rainfall was excessive, threshing progressed favorably until the last two weeks of the month, when it was considerably delayed in the northern and western sections by heavy and continued rains. Excellent yields were generally reported but much of the grain was damaged to a greater or less extent by the wet weather. In a number of the extreme southern counties corn and cotton were considerably injured by drouth, and late corn also suffered from lack of moisture in a few of the northwestern counties, but as a rule the corn crop continued in excellent condition. The ripening of early corn was somewhat retarded by cool, showery weather during the last two weeks of the month, but the bulk of the crop was out of danger from frost by the 30th, and cutting was in progress. In a few counties corn was badly broken down by high winds. Cotton improved after the rains of the 25-26th and picking was begun before the close of the month. Pastures became quite short in a few of the southeastern counties but were revived by the rains during the last decade; elsewhere they continued in excellent condition. Late forage crops made a heavy growth, and an exceptionally fine crop of millet was harvested in the northern counties, though some was damaged by the rains. Considerable timothy was threshed, with good yields. The prairie hay crop in the southwestern counties was exceptionally heavy, but the weather was unfavorable for curing it. Late potatoes did well, except in some of the southeastern counties, but the acreage was small. Sorghum making was in progress at the close of the month and the crop was reported very fine. Tobacco was also an excellent crop. Apples continued to drop to a greater or less extent, and there was some complaint of bitter rot, especially in the southeastern counties. Plowing for fall seeding was considerably retarded in the southern sections during the fore part of the month by the dryness of the ground, while during the latter part the soil in some of the northern and western counties was too wet.

SEPTEMBER.—September was remarkably cool throughout the State, the mean temperature of the month, 63.2 degrees, being about 5 degrees below the normal. For the State as a whole it was the coolest September during the past fifteen years, but at nearly all of the older stations lower September means are on record. Light frost occurred as early as the 4th, and killing frosts, with thin ice, occurred in localities on the 12th, 13th and 14th. The highest local monthly mean, 68.6 degrees, occurred at Caruthersville, and the lowest, 60.2 degrees, at Maryville. The highest temperature recorded during the month was 95 degrees, at Willow Springs on the 7th, and the lowest, 30 degrees, at Ironton and Potosi on the 14th. The precipitation was very unevenly distributed and exceeded the normal amount over much the greater portion of the State. The heaviest rains occurred in the central and western sections, portions of those sections receiving a total of from 6 to over 10 inches. Excessive rains in several of the western counties during the last decade of the month caused destructive floods in a number of the smaller streams. The average precipitation for the State was 4.78 inches, 1.22 inches above the normal. The greatest local monthly fall was 10.92 inches, at Wheatland, and the least, 1.81 inches, at Hermann. A fall of 6.55 inches in twenty-four consecutive hours occurred at Bethany on the 23rd-24th. The cool, showery weather was unfavorable for maturing the corn crop, but by far the greater portion was out of danger by the 15th, and practically the entire crop was well matured by the close of the month. Cutting was generally completed by the 20th. Killing frost on the 13th damaged some of the latest corn in portions of the northern and eastern sections, but the loss was comparatively slight, except in a few counties. During the last decade of the month, however, there was complaint that corn in shock was molding, and that on the stalk sprouting and rotting where down, as a result of the continued rains and cloudy weather. In a few of the western counties floods in the smaller streams washed away some corn that was in shock and covered standing corn with mud. Some stock was also caught by the floods and drowned. Cotton picking, in the extreme southeastern counties, progressed favorably during the fore part of the month, with fair yields, but was considerably retarded by rains during the latter part, and some cotton was damaged. Where threshing had not been completed that work was also delayed by the rains, and considerable grain in stack sprouted and rotted. Except in a few counties, where the ground was too wet, preparations for fall seeding progressed favorably until the 20th, the soil being generally in fine condition, and in some districts wheat sowing was nearly completed, but during the last decade of the month work was generally at a standstill owing to the wet weather. Early sown wheat came up to good stands, but some of that sown just before the rains rotted. Tobacco was generally cut and housed in good condition. Potatoes yielded well, but there was considerable complaint of rotting in the ground. Pastures were excellent. Sorghum making progressed favorably and the yield was good and the syrup of fine quality. Apples continued to rot and drop badly in some localities, but as a rule they matured well, though the crop was light, except in a few counties. Gathering was in progress at the close of the month.

OCTOBER.—With the exception of the first five days the month of October was mild and pleasant, the mean temperature for the state, 59.5 degrees, being about 2 degrees above the normal. The highest local monthly mean, 63.1 degrees, occurred at Caruthersville, and the lowest, 55.4 degrees, at Maryville. The highest temperature recorded was 88 degrees, at Lebanon on the 22d, and the lowest, 23 degrees at Potosi on the 29th. Over the greater part of the State the total precipitation ranged from 2 to 3 inches, and in portions of the central and northern sections it exceeded 3 inches, but over the northern counties of the southwest section, and also over a few counties of the southeast section, there was but little more than 1 inch. The average for the State was 2.52 inches, or practically normal. Except in portions of the northern sections, by far the greater part of the precipitation occurred during the last five days of the month. The greatest local monthly fall was 4.72 inches, at Oregon, and the least, .87 inch, at Jackson. The weather could hardly have been more favorable for drying out the corn, and the damage resulting from the previous wet weather was not as great as had been feared. In a few localities the crop was reported damaged one-tenth to one-fourth, but as a rule the damage was comparatively slight. Gathering was in progress during the latter part of the month. The weather was also very favorable for cotton picking and about one-half the crop had been picked at the close of the month. Wheat seeding was greatly delayed by the wet weather during September and the first week of October, and in some of the western counties the ground could not be worked until after October 15th, but in most sections the soil was in good condition during the middle and latter part of the month and seeding was rapidly completed. Excellent stands were reported, as a rule, but in many of the central and southern counties there was much complaint of fly in the early sown, and in some of the southeastern counties considerable damage was done by grasshoppers. In some of the southern counties wheat was needing rain at the close of the month. Good stands of rye were also reported. Apples were practically all gathered during the month and were generally of fine quality, but there was complaint that they were not keeping well, owing to the warm weather. Pastures became short in a few of the eastern and southern counties, but elsewhere they continued in good condition.

NOVEMBER.—The mean temperature of November, for the State, was 50.1 degrees, 6.8 degrees above the normal. Except in the northwest section it was the warmest November of which there is any record in this State. At St. Louis, where the record (including that at Jefferson Barracks) extends to 1826, the highest November mean previously recorded was 51.4 degrees in 1830, while that of November, 1902, was 53.3 degrees. The highest local monthly mean, 55.3 degrees, occurred at Caruthersville, and the lowest, 41.6 degrees, at Maryville. The highest temperature recorded was 85 degrees, at Zeitonia on the 13th, and the lowest, 18 degrees, at Maryville and Oregon on the 27th. The average number of days with minimum temperature below 32 degrees was 6. The precipitation of the month exceeded the normal amount over nearly the entire State, and was heaviest in portions of the southern sections, where the total fall ranged from 4 to over 6 inches. Over the remainder of the State there was generally from 2 to 4 inches. The average precipitation for the State was 3.52 inches, 1.05 inches in excess of the normal. The greatest local monthly fall was 6.21 inches, at Olden, and the least, 1.51inches, at Conception. The snowfall of the month amounted to less than 1 inch, except in portions of the northern sections, where it ranged from 1 to 4 inches. The warm, showery weather caused wheat to make a vigorous growth, but in some counties there was complaint that the plants were being injured by rust. Much of the early sown, particularly in the central and southern sections, was also injured by fly. The bulk of the crop, however, was sown late and was generally reported in excellent condition. In some counties wheat became too rank and was pastured. In portions of the central and eastern sections the weather was favorable for corn gathering, and in many localities that work was completed, but in a majority of the northern and western counties it was greatly retarded by the frequent rains and a large part of the crop still remained in the fields at the close of the month. In some counties where corn was down badly much of it was spoiled, and that in shock was also damaged by the rains in some districts. Cotton picking was about completed by the close of the month. Fall pastures were reported short in a few localities, but as a rule they continued in excellent condition, and there was an abundance of stock water in all sections.

DECEMBER.—December was a disagreeable month throughout the State, the weather being generally cloudy with frequent rains and snows and considerable sleet. The mean temperature for the State, 30.7 degrees, was 2.3 degrees below the normal. The highest local monthly mean, 40.0 degrees, occurred at Caruthersville, and the lowest, 21.8 degrees, at Maryville. The highest temperature recorded during the month was 68 degrees, at Mt. Vernon on the 1st, and the lowest, 7 degrees below zero, at Grant City on the 26th. The average number of days with minimum temperature below 32 degrees was 24. The precipitation exceeded the normal over a large portion of the State and was exceptionally heavy over the extreme southeastern counties, where it ranged from 6 to over 9 inches. In portions of the northern, central and southwest sections, however, there was a deficiency. The average precipitation for the State was 2.91 inches, an excess of 0.68 inch. The greatest local monthly precipitation was 9.31 inches, at Caruthersville, and the least, .94 inch, at Carrollton. The snowfall of the month was heaviest in the extreme northern counties, where it ranged from 6 to over 12 inches, and over a small area in the extreme southwestern portion of the State, where from 6 to 10 inches fell on the 4th. Over a considerable portion of the southeast section and in a few localities in the central and southwest section there was less than 1 inch. The greatest local monthly fall was 12.8 inches, at Oregon. Up to the 24th wheat suffered little or no injury from unfavorable weather conditions, but during the severe freezing weather from the 25th to the 28th the ground was bare and in some counties it was feared the crop had been injured. In most sections, however, it was reported in good condition at the close of the month. In some of the southern counties early sown wheat was considerably injured by rust and fly. Except during the last few days of the month, when the ground was frozen, the weather was very unfavorable for corn gathering, and a considerable portion of the crop remained in the fields at the close of the month, especially in the central and northern sections. In most sections fall pastures, where not over stocked, afforded good grazing during the greater part of the month. In a few of the southern counties fruit trees were broken down to some extent by an ice storm on the 14-15th.

SIXTH ANNUAL MEETING,

Improved Live Stock Breeders' Association.

Convened in Springfield, Missouri, January 6 to 9, 1903.
(Held Under Auspices of State Board of Agriculture.)

ABSTRACT OF ADDRESSES DELIVERED.

ADDRESS OF WELCOME.

Hon. J. E. Melette, Mayor of Springfield.

Mr. Chairman and Gentlemen—Allow me to extend to you gentlemen a welcome of the people of this city, a very formal and a very easy and pleasant task I assure you to do. I am not here, however, to extend my remarks or to indulge in any lecture which would give any advice upon farming. I could do so probably, but I think it will be better and less humiliating to me and probably of just as much interest to the farming community at large to form a committee to wait on me privately and let me communicate to them my views and my experiences upon the question of farming. Ordinary, plain old-fashioned farming I used to think I knew something about. I had a good deal of experience along that line. Nothing in my career, however, that I can recall to-day will justify me in bragging, especially upon my record in that line, but in the first place, gentlemen, it occurs to me that we are united, we are all interested. Men of the city, men of the country, politicians, lawyers, doctors, churchmen, statesmen, all are alike interested in the great question dealing with the promotion of agriculture. Ruskin, I think it was, stated a great truth and a great fact when he said "To watch the corn grow, the blossoms bud, to breathe hard over the plowshare and over the spade, to reap, to love, to hope, to pray, these are the things that make men happy," and upon our knowing and our teaching these few things depends the prosperity or adversity of the world. It is an old saying, but true, so old probably and so often repeated that it makes no impression scarcely upon us when we hear it, but a fact nevertheless, that "Upon the fortunes of the farming classes of the community depends the entire prosperity and adversity of all else besides in the world."

Farming as a business has changed remarkably within the last hundred years, even within the last fifty years. It used to be simply a business; it is something more now, not only a business, but it combines the sciences of chemistry and geology. All the researches of science and learning are necessarily interested in its development and in its promotion. There are many problems which often confront the farmer with which he has to deal. I think that I have been connected enough with the craft to realize and appreciate something of the discouragement and disappointment through which he has to pass, and yet there comes to that life and belongs to it exclusively an independent far above that of any other calling. If some idea or some method could be devised by which the young men of this country to-day could be impressed with the importance, the necessity of getting out into the country and engaging in the farming business, instead of crowding the cities and the professions in a mad unseemingly struggle for life, what a great progress would be made, and the great change that would come over the country would be manifest indeed. How few of us realize that it is in the country, from the farming community springs the best men of the nation. Sometimes I think there used to be, and probably is yet, an idea among the young men of certain classes, that there is something about farming of which they need to be a little ashamed and do not like, are trying to get away from it. To leave the farm and get to town is the tendency of the age and has been for the past generation or two. It seems to me it is increasing rather than diminishing. There is a wrong, a radical wrong somewhere about it. It is only in the country and with those who are brought in contact and hold communion with the sky, the air, the earth and all living things—only those it seems to me appreciate life to its fullest extent. From that class, from those in the country rather than those in the city, from the crowded trades and professions, arises the energy that tends to make and create a perfect mind. We find it so in the history of the past that when a great man is needed for any particular thing you generally find he came from the country, and that the surroundings had been that of a country life. What seems to me is lacking to a great extent among the farming community and manifest in this community to-day, in fact manifested throughout the country wherever we go, is a lack of enthusiasm for the calling, lack of interest taken; these things must not exist where there is any substantial progress and success.

These fifteen cattle were fed by H. J. Waters, Director of the Missouri Experiment Station, Columbia, Mo. The cattle weighed 1,466 lbs. in Chicago, and sold on January 15th, 1903, for $6.85 per cwt., this being $1.00 above the highest market price paid for any cattle on sale that day. Does intelligent feeding pay?

Now, when I think over my life, I can see great changes that have been wrought in the methods of farming and the whole agricultural system. It seems to me that notwithstanding the lack of interest so perplexing, we find wonderful and tremendous progress has been made. Take stock raising—nowhere, in no line of business has there been such wonderful advance made, such remarkable progress. I remember as a boy, we used to raise hogs and cattle—it was my principal business—that is they grew, we call it raising them. I remember when the time came for getting the hogs to market, it required about three boys and a dog usually to each hog in order to keep the procession in line, and often a drove of fifty or sixty hogs strung out over ten miles of road. And the pigs—I am not sure that it ever happened, but I think I came near to resorting to that practice of helping to tie knots in their tails to keep them in the pen. The idea has gradually gotten into the people's hearts and heads that it is best to raise good stock, the very best possible. Among those lines the greatest progress has been made.

A meeting of this kind ought to have attracted every farmer from Greene county. Representative men from over the State, from other states, are here to discuss the great questions in which we are all interested, questions that underlie the prosperity and the advancement of the whole country.

There is another suggestion which has occurred to me. It is a bad sign of the times which ought to be changed, ought to be eradicated in some way, the teaching ought to be in the opposite direction. So many men and boys now who get a common school education feel at once that they are disqualified for farm life, and break for the city and town office. That I think is the course of most of the American people. So many, both boys and girls, feel that the great object in life is to get some kind of official position. Nothing better offered, they will take a clerkship. Very often you find boys leaving the farm, coming to town trying to get a job in county offices, or a clerkship in the government employ, and in my judgment a greater curse, a greater misfortune never could possibly have happened to an energetic live boy. I regret to see a young man leave the open air, and the fields, and seek a position of that kind simply you might say blotting out his life and his usefulness. It destroys his independence. If a young man could see the end as he will see it later, he would realize it. He covets a county clerkship, the office of recorder, Congressman or representative—some place where he can draw a specific salary. It seems to be the goal and ideal of the average young man to-day. He does not realize that the person who gives him that job to-day can kick him out to-morrow. The man who gives him that position is himself liable to be kicked out. If he succeeds in holding it a number of years, so much the worse, for every hour disqualifies him for the duties of life, takes away his self-reliance and makes him simply a part and piece of a machine. Of course these places have to be filled, clerical duty has to be performed, but I would teach the young man to-day to shun it rather than to seek it and to keep out of it if possible. Of course if a young fellow realizes that he has not energy and self reliance and vigor enough to enter the struggle alone and carve out a career for himself like the farmer, in other words he finds himself in the situation of the farmer's dog—fit for nothing else, but probably was fit for "coons"—probably he might run for office. If he has a spark of energy, let him seek the farm, get out in the open air, get hold of a piece of land forty to one hundred and sixty acres, stay by it, raise potatoes and corn and cattle, and be a free and independent man. No matter if a man owns but an acre and has but a log cabin on it he is independent; that acre of land is his domain, his kingdom, and the cabin is his castle, he is a monarch and can live absolutely free and independent of the world, and it is the only life that offers such advantages.

Now I have no words of advice, gentlemen, to offer you. I wish I could give you some ideas on stock feeding that would be worth while to carry away and spread out over the State, but I have nothing of that kind. The right way is to begin at the beginning and learn the business, learn the trade, start low and grow up. This is especially true of stock raising and farming. I have observed that those who were the most successful in that business generally started in a small way, studied the problems as they went along step by step, so that they were able to take care of them as they grew. Those who started in at the top with an expensive farm and a large herd of fine stock, usually went into bankruptcy at a very early period and had nothing to show for it.

Now, gentlemen, I could say a great deal more if I had it to say, but I will not afflict you any further with any remarks of mine on this subject, except to simply say to you as an organization and as an individual, that we cordially welcome you to our city. The very best we have is at your service. We will do all we can to make your meeting here with us pleasant, and hope that at some time you will return. I sincerely trust that you will have a full attendance, that the meeting will be prosperous and effective, and that new ideas may originate here during the sessions and be spread out over the State, and that the interest may be far reaching in years to come.

I thank you for the privilege of meeting with you this afternoon. I welcome you to Springfield.

RESPONSE TO ADDRESS OF WELCOME IN BEHALF OF BOARD OF AGRICULTURE.

(By Hon. Alex. Maitland, Richmond, Mo.)

Mr. Chairman, Ladies and Gentlemen:

As a representative of the State Board of Agriculture, I wish to say that we are very much pleased with the hearty welcome extended to us by his honor, the mayor, and although this is, I believe, about our first meeting in Southern Missouri we are pleased with what we have seen, and we thank you for your welcome to this Queen City of the Ozarks.

In calling your attention to the work of the State Board of Agriculture, I will say that its work is being gradually enlarged, every year adding more and more as the growth of our State proceeds. Some years ago we had the crop reports and to that has been added the veterinary service, and to that has been added the farmers' institutes and to that added another feature which I had almost forgotten—the State Fair.

In regard to these various matters—we take up for instance the work of the crop reports. Our Secretary has in every county in the State one or more correspondents selected from the very best farmers of the various counties who report to him the condition of the crops in their various localities. Upon this basis he formulates a report of the whole State which has brought our present Secretary great credit, as his report is considered by the Grain Dealers' Journal, which is the great grain journal of the United States, as superior to even the Government report, which is a great credit to the Secretary of the Missouri State Board of Agriculture.

Dr. Casey spoke of the immense value of the poultry industry in the State, not only in the State but in the nation. We appreciate his figures very much, but we want to say to him that the crop report shows the where-with-all to feed this poultry. It takes a wonderful amount up in my cribs at home to feed poultry and Missouri this year, according to the crop reports, has raised a sufficiency of corn and wheat and oats to feed all that vast amount of poultry and give his honor a new supply of eggs. Our corn crop this year is second only to that of Illinois. In average yield per acre we are first in the United States, but in total product we are second, I believe, to Illinois, which has a total product of 314,000,000 bushels, while our total product is 307,000,000 bushels. In wheat we are the second State in the Union, with a product of 61½ million bushels, second only to Minnesota in all the United States.

So much for our crop reports and the manner in which they have been collected. Our Veterinary Service has grown to be of immense value. For some time it was supposed that one veterinarian would be able to attend to all the various contagious diseases of the State, but so rapidly has transportation and interstate commerce with the various states disseminated the various contagious diseases from the south and west that I think at present there are five or six deputy State veterinarians in the State watching that matter. Now if there are some cattlemen here, they will recollect the time, not but a few years ago, before this Veterinary Service was placed under the supervision of the State Board of Agriculture when it was impossible to go to any of the great feeding markets of the cities during the warm months of the year and purchase any feeding cattle. In my country, forty-five miles east of Kansas City, we lost thousands upon thousands of dollars in that way. One of my neighbors, a breeder of Galloways, went to Kansas and bought two car loads of feeders without knowing that that there was any infection near them aud brought them home and lost between thirty and fifty head of thoroughbred Galloway cattle, besides a hundred ordinary individuals. Now the Missouri cattleman goes to the feed yards with the assurance that he is protected by this Veterinary Service. The Veterinary Service has not only saved Missouri millions of dollars, but it has assured a steady supply of cattle the the whole year through.

I would much rather that Mr. Ellis, the Secretary of the Board, would have discussed the farmers' institutes, but probably when Col. Waters gets an opportunity, he will say something about it. Years ago when the Legislature first appropriated a small sum for the farmers' institutes throughout the State it was scoffed at by a great many people, and, in fact, the attendance was small. In those localities where the institutes have been in session this year the gentlemen who were at the institutes tell me that there have been great crowds in attendance and that the institutes this year have had much greater success than formerly. They have introduced a new feature in carrying along on certain railroads a car with the products of Missouri in it, and they have made that car a success. It was supposed we had on our institute force men who were good educators but not cattle raisers, theoretical but not practical men, but such is not the case. Every man on the force is known for his practical knowledge, when he speaks the farmers know the truth of his statements, though he may not express himself as artistically as some others.

Now I come lastly to what constitutes one of the great interests of Missouri, and I wish to secure the hearty co-operation of the people of Greene county and Springfield, especially, for assistance in that, our State Fair. Missouri has been compelled for years to go and show the stock she produced at various other fairs in our neighboring states. Although we have been first in the Union in a great many lines of stock, still we have been compelled to take our stock to other fairs, having no home place to show them. We have the finest Shorthorns in the world. Last year we took 75 per cent of the Hereford premiums in the west. At the World's Fair in Chicago we brought back $35,000 in cash premiums to Missouri; we defeated Kentucky in saddle horses, mules and jacks; we tore the laurels from Vermont in Merino sheep. Mr. Gentry took ten premiums for Berkshire hogs over the world at large. Seven more went to parties to whom Mr. Gentry had sold hogs, and only one premium got away from the Missouri hog. There is no fiction about this, it is a fact. Other states competed for an exhibit of the variety of products, but Missouri was so far in the lead that we outclassed the other states in everything from the cotton plant to an ear of corn. No state in the Union competed with us in any measure at Chicago for the variety of farm products.

Let us go to Omaha. Not one dollar could we beg from our Legislature to make an exhibit. The State Board of Agriculture, in consultation with Governor Stephens, asked him to appoint two hundred commissioners over the State—it should be confessed with humiliation by every Missourian—to beg money for a Missouri exhibit at Omaha. In my little town of Richmond we raised $60. We raised in all $14,000.00 with which Missouri went to Omaha and captured more premiums than all the other states put together. These are facts, gentlemen.

We had to keep working and working and doing our very best to get the State Fair started. We succeeded in getting an appropriation of seven thousand dollars at the last session of the Legislature to start it at Sedalia. A great many people do not know how the thing was started. The Legislature passed a bill that certain towns that wished to make application for the location of this State Fair should do so inside of twenty days. Six or eight towns made application. To these was confined the Board's choice of location for the Missouri State Fair. Sedalia was considered the central and largest town. It is not large enough—everybody admits that—to take care of the people, but still it was the best we could do. We located it at Sedalia and they have extended the appropriation to fifty thousand dollars, with the Breeders' Fund that the Legislature gave to us, we have expended about eighty-five thousand dollars; whereas the Illinois appropriation was two hundred and fifty thousand dollars to start with, which reminds me of how we are everywhere talked about as "Poor old Missouri." You gentlemen have been on the fair grounds and know whether that money has been expended judiciously or not. I will say for the committee that they, with the exception of probably two of them, had never had any experience in the management of a State Fair. Governor Colman and Mr. Gentry had had some experience, but outside of that no member of the Board had had any, unless possibly Mr. Ellis had had some. They spent that money; they held two successful fairs and we had spent every dollar when the last settlement was made with a surplus of $600. We paid every premium as soon as it was awarded and the certificate brought to the office of the Secretary, the warrant was issued immediately for the money. No premium has ever been cut down in Missouri and I am opposed to her ever getting a reputation for doing that.

We wish to get your co-operation for our State Fair. All of you have more or less influence with the members of the Legislature, and it is to the Legislature that we must always look for an appropriation sufficient to place Missouri's fair upon as grand a scale as any state in the Union and make her, as she truly is, "imperial mistress of states."

RESPONSE IN BEHALF OF THE STATE GRANGE.

(By C. O. Raine, Monticello, Mo.)

Mr. Chairman, Honorable Mayor, Ladies and Gentlemen:

It is indeed with pleasure that I appear before you to-day in the interest of the organization known as the Grange or the Patrons of Husbandry, organized as a National organization in 1867, as a State organization in the year 1872, since which time the organization has seen many prosperous days, and yet many days of decline and discouragement. Yet we are happy to say that during this time the State Grange has never failed to hold its annual session. Many, perhaps, in your own county of Greene were members of this organization some years ago and are aware of the fact that the organization was once strong in Greene county. But it has come to be a fact that, as stated in the Scriptures, the first shall be last and the last shall be first. Missouri was not first, but she was second at one time in this great work, Iowa being first. She has been reduced until she is almost last in Grange work. Yet I say, we are glad of the fact that the organization has never become extinct, and we realize that from now on the work of this organization will prosper and grow in our own State of Missouri.

I wish time would permit and that I had the ability to impart to you the need of this great work among all the farmers of Missouri. I do not mean the heads of families when I speak of farmers, I mean the entire household, because this organization takes within its doors not only the man, but the entire family. It is at these meetings that he can take his wife and daughters and take part in sessions that pertain to our interests as farmers, as citizens, as neighbors and as friends.

The last session of the State Grange was held in the little town of Maywood in the northern part of the State, being one of the most enthusiastic meetings held in years. While not largely represented, we feel that much good was accomplished by that meeting. The last National meeting was held in the state of Michigan. Michigan has in the last three years done more to bring about reorganization than any other state in the Union. At these meetings it seems but fitting that not only the Mayor and President of the Board of Trade, but the Governor, should welcome to their state, to their town and city, that great organization which has made the greatest growth in the last year in its history. In 1876 the National organization held its meeting in St. Louis. We are going to ask the hearty co-operation of the Industrial Associations of this meeting; also, of the people of Greene county, the people of this city and the people of the entire State of Missouri, to assist in bringing back in 1904 the meeting of the National Grange to the city of St. Louis. It was at the meeting of 1876 that the declaration of principles that were laid down by this organization was drafted, being one of the broadest, clearest, keenest, and most notable declarations that has ever been drafted by any organization.

We may state how many dollars have been saved to the farmers of the country through co-operative trade arrangements, and through mutual insurance companies, both fire and life, and something can be stated in regard to the vast saving to the farmers of the country through wise legislation secured, and unwise legislation defeated through the influence of the Grange; but when we undertake to make any estimate of the moral, social, and mental development that has been brought to the farmer and his family through Grange influence and Grange teaching, we are lost in the magnificent results obtained.

It is absolutely impossible to give any intelligent estimate of the development of the noble principles of manhood and womanhood in the mind and heart of the million of people that have been connected with the Order, and of the millions of other people with whom they have been associated. It is along this line that the grandest results have been achieved. Thousands of farm homes have been made happier and better, and the members of farmers' families have been reaping the highest enjoyments of life through the quickened mental abilities by Grange influence, while a higher ideal in life has been reached by true Grange teaching. With these general statements, we leave the most important results during thirty-two years of Grange work to the imagination of our readers.

In matters of legislation, among the first objects to claim the attention and engage the efforts of the Grange were the State agricultural colleges of the country, many of which in their early days were united with, and became a part of, classical colleges and universities, thus in a large measure destroying their identity as agricultural colleges and rendering them practically worthless for the objects for which they were established.

Through the influence of the Grange a separation has been effected in a majority of states, and distinct agricultural and mechanical colleges have been established. In most of those states where the efforts for a separation have not been successful, the college authorities have given much greater recognition to agriculture, and with but few exceptions these institutions are now doing a grand work in educating the farming youth of the nation.

It was through the direct influence of the Grange that the additional appropriations for agricultural colleges by Congress were confined to instruction only in agriculture and the mechanic arts.

The Hatch act for the establishment of State Experiment Stations, which are doing such great work for the agriculture of this country, became a law by reason of the efforts of the Grange.

It was through the influence of the Grange that the Department of Agriculture at Washington was raised to the dignity of other departments of the National Government, to be presided over by a secretary of Agriculture in the President's Cabinet, thus giving farmers a voice in the policy of the government.

Through the direct influence of the Grange the Interstate Commerce Commission was established by act of Congress, which in a measure aims to control interstate traffic, and gives the people a means of redress from the injustice and extortions which are often practiced by corporations, thereby saving the people vast sums of money in reduced rates of transportation.

The subject of taxation has always engaged the attention of the Grange, and it was through the influence of this organization that in many states the burdens of taxation have been, in a measure, at least, equalized by a more equitable assessment of real estate between city and farm property, and by the enactment of laws taxing personal property and corporations which had hitherto paid little, if any, taxes for local or State purposes.

The Grange is strenuously opposed to adulterations of all kinds, and mainly through its influence State and National laws have been enacted to control the sale of oleomargerine and other butter frauds and protect the great dairy interests of the country from these vile compounds which the unscrupulous manufacturers would place upon the market as pure butter.

Through the influence of the Grange most maple sugar producing states have enacted stringent laws against the adulteration of this farm product, thereby protecting both producers and consumers.

The Grange successfully fought the driven well and sliding gate patents in the courts, saving enormous sums of money in royalties which were being extorted from the farmers and others using them.

Through the influence of the Grange upon Congress the extension of the patents on sewing machines was prevented, saving to the people fully fifty per cent. in the prices amounting to millions of dollars annually.

The Grange has a grand record of usefulness in legislation in nearly every state in the Union for its influence on the side of justice and equality in the enactment of many wise and judicious laws in the interests of the people, and for the protection and advancement of the farming industries.

A recent victory of the Grange, and one of its grandest achievements, is the establishment of rural free mail delivery in various achievements, of the country. The Grange was the first organization to publicly proclaim that if it was right for the government to carry mail to the homes of people in cities, it would be right for it to carry mail to the homes of people in the country, and through the discussion of the question and intelligent presentation of the matter to Congress, appropriations have been secured; first, for experiment, and now practically for permanent establishment of the system of rural free mail delivery. This breaks the isolation of farm life, will tend to secure better roads and advance farm values wherever it extends. The results in this matter alone will justify the entire cost of the Grange from its establishment to the present day.

I wish to extend to all the various Associations meeting here, the greeting of the Missouri State Grange. We hope that some arrangements may be made whereby we may meet in conjunction with you in the future. Having placed this meeting beyond the time limit of this law as laid down by the National Organization, it was impossible for us to meet with you as of yore. Hence, I will say that the Missouri State Grange sends greetings to each and every one of you, and, your Honor, we thank you for your kindly words of welcome.

RESPONSE IN BEHALF OF STATE POULTRY ASSOCIATION.

(By Dr. J. H. Casey.)

Mr. Chairman, Ladies and Gentlemen: It is with feelings of pleasure and also of regret that I arise to-day to say a word in response to his Honor's remarks—with regret, because I am ill-fitted to reply in adequate terms to the generous welcome of the Mayor, and with pleasure, that at last the Missouri hen has finally found a place in the State Board of Agriculture. It is only a few years ago since the hen was relegated to the barnyard, and very few of you farmers or you agricultural men knew anything about her, but to-day, thanks to the united efforts of the State Boards of Agriculture throughout the different States, through their Agricultural Colleges, and the scientific researches of so many men, the American hen to-day is fast taking a place throughout this country as one of our greatest commercial factors.

During the past two or three weeks I have gleaned from our worthy Secretary of the State Board a few figures of the breeders of the Missouri hen, and when you gentlemen listen for one moment, if I am not mistaken, I think you will be surprised, not that I wish to discourage the efforts of any other part of this great Board of Agriculture, but simply to bring them forward to your notice that you may know that poultry has taken a stand and is worthy to-day of your consideration. Just think of it, in the year 1901 the total product of poultry, eggs and feathers in the State of Missouri was $22,500,000. These are facts, gentlemen, not simply figures, and I can prove that by our worthy Secretary. Take the United States, for instance, you scarcely realize this when you hear the figures, but look, in 1898, the output of wheat, your great staple, was $237,000,000; oats, $150,000,000; tobacco, $60,000,000; barley, $120,000,000; coal, a little over $200,000,000; and that of poultry, $290,000,000. It seems incredible, and yet statistics show this. I speak of these things to show you, gentlemen, that the poultry industry is not to be despised, and to-day, in this beautiful town of Springfield, we are holding our eleventh annual anniversary. We are bringing poultry here to-day, not simply to make a show of poultry, not simply to bring spectators, but mainly for the purpose of educating the public up to the fact that poultry is worthy of their notice; that poultry is going to be one of our best commercial products, one that every city will be proud of because it is one of the best revenue producers that we have; it has been ignored and laughed at by many because it has not been thoroughly investigated, but I think in comparison even with the grand live stock industry it holds a place that is worthy of our consideration. I do not wish to enlarge on that, however.

And now I wish to invite all of you here to-day, and through the Mayor, every person in this city to come to our magnificent poultry exhibit and help us to make it what it is, a grand instructor.

RESPONSE.

(By Col. G. W. Waters, Canton, Mo.)

Now I am not engaged at present in the live stock business—not on account of age—but all along, since a mere boy, I have tended the sheep and swine, and have cared for the cattle, horses and mules, so I believe I am in a position to appreciate, in some degree, the value of improved live stock, and if there is any one class that deserves our honor more than another, it is the patient workers along the line of improvement of our domestic animals. I believe I speak advisedly when I say that the breeders here, all the way along the line, from poultry to the improved Shorthorns and Herefords, and I may say greater than all, fine horses, these are the men we should delight to honor—because what, and because why? The Secretary of the Board of Agriculture, after patient research and careful investigation, has announced the fact that grand old Missouri in the year of 1902 has raised the phenomenal corn crop of 307,000,000 bushels, forty bushels to the acre, a yield per acre larger than any other State in the Union, and great crops of forage and hay, and great crops of oats, and a grand crop of wheat—all of these products. But let us turn to the corn crop. This corn crop of 307,000,000 bushels represents a commercial value, when put upon the market, of $100,000,000. It will not come upon the market as grain, but in a more concentrated form. It will first be manufactured not into that other article that is deleterious to everyone of advanced thought, but into something that is good for everybody—into beef, into pork, the dairy products, eggs, etc. These are the things that these breeders are doing, have been doing—what?

They have been perfecting the machinery for the manufacture of this corn, this hay, this grass and this fodder, and all the forage crops and all the feeds of the farm into the finished wholesome products. And it takes but this simple and casual reference for us all to appreciate the difference between the use of a first-class machine in the manufacture of any kind of product, and a poor machine, and that is what they have been doing. Suppose that by reason of the improvement of our live stock which this Association represents— the Missouri Live Stock Improvement Association, which embraces all the farm animals—suppose that by reason of an improvement of the animals and machinery so as to get an increased efficiency of the use of the beast by five per cent increase, what would it mean? A five per cent increase now over and above what otherwise might be had, would mean an increase of $10,000,000, yes, more than that. It is easily possible to increase the efficiency of our feeds by feeding them into animals that are capable and competent to give you good results. It is easily possible to increase the efficiency to ten per cent.

You know every time my friend Mr. Harned brings about a development of his animals that will increase their intrinsic value as machines, he has been helpful to the cattle industry of the entire State. That is what he has done and is doing; and my friend, the President of the Poultry Association, when he and his coworkers have increased the efficiency of poultry they have upon the farm, when they have brought forward a strain of chicks that will produce ten per cent greater product in eggs, he has added a ten per cent increase, of $2,000,000 more. But I am getting into figures. However, it means a whole lot, that ten per cent, and will any of you gentlemen tell me that it is not possible as between a mongrel grade and mongrel management of poultry—that it is not possible to increase the production ten per cent? It is easily possible. It requires brain work. Just one central thought, and the only one that I intended to impress, that this Association will have for consideration such propositions as shall lead her not only to the improvement of our live stock all along the line, not only to do so ourselves, but to induce others to improve the live stock. It is one thing to investigate and find out the truth; another thing to promulgate that truth and get it among the people and get the people to accept these advanced propositions, and this is one of the purposes of the Association here, and this State Board of Agriculture is standing behind these people and they will do the best they can and will use their office as a propaganda for getting these advanced thoughts, these improved ideas out among the people.

I will say just this to the Mayor. He made a statement awhile ago that struck the key note. He said farming used to be a business. Farming is to-day not only a business, but it is more than a business. Farming has to-day become not only a business and art, but it has become a progressive science. He who fails to recognize the fact that agriculture embraces a progressive science, fails to grasp the situation, and fails to grasp the spirit that has come to us in this twentieth century.

RESPONSE IN BEHALF OF GOOD ROADS ASSOCIATION.

(By Geo. F. Reed, Springfield, Mo.)

Mr. Chairman, Ladies and Gentlemen: I have used every effort possible to shift this responsibility upon the shoulders of someone else, but our Secretary of the State Board of Agriculture would not have it otherwise but I should respond on behalf of the Good Roads Association.

Our first meeting was held in Chillicothe a few years ago and there was an exhibit of road making machinery. The next year it was held in Springfield. That started the beginning of the road improvement movement in Missouri. It has been worked up till the State organization has gotten a road law enacted which is considered by everyone to be one of the best laws in any State in the Union. Road improvement under the operation of this present law has been a great deal more extensive than it was under the old law.

In regard to our roads and the effort that is being made to change our road law, I wish to emphasize the fact that it is the desire of Greene county that our common road laws remain on the statute books as they are.

On behalf of the Good Roads Association and the people of Springfield, I extend to you a hearty welcome.

MISSOURI'S PART AT ST. LOUIS WORLD'S FAIR.

(By Hon. M. T. Davis, Aurora, Mo.)

Mr. President, Ladies and Gentlemen: Welcome indeed is this opportunity of meeting with the growers and breeders of our State, and discussing with you ways and means to do our imperial State justice before the world at the great exposition to be held within our borders during the year 1904.

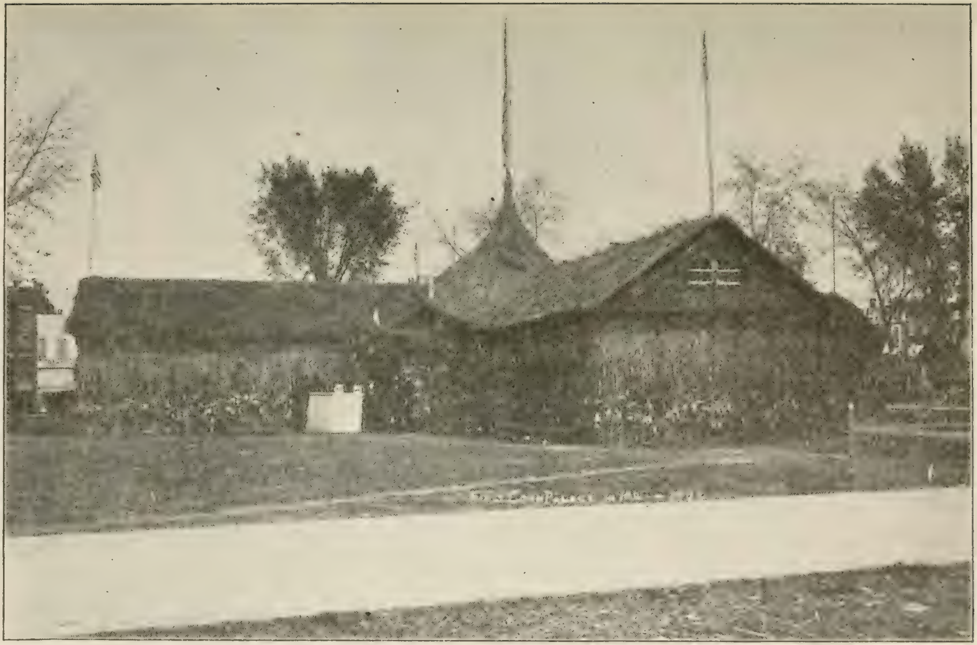
And I want to say to you gentlemen that Missourians have just cause to feel an unending pride in this great celebration, not only because it will assuredly be the greatest exposition spectacle the world has ever seen, but because it will serve to revive a sentiment of loyalty and thanksgiving in one direction where it is now almost extinct; and while we must share the greatness of the exposition with the outside world, Missourians can take to themselves the credit of reviving sentiment and giving substantial evidence of gratitude to Providence for taking from under the yoke of Monarchy, and placing in the fostering care of Freedom, the great territory wherein now dwell a prosperous and happy people.

That the celebration of the anniversary of a great event in the history of a Nation's life, instills patriotism and love for country and her institutions, and instills energy and ambition to keep on striving to maintain her ideals, cannot be denied. It is the duty of every nation to mark her natal days in such a manner that every sojourner within her borders will know that her people love their country and keep ever alive their obligations to State and Country.

So we celebrate Independence Day, and so was the Centennial Anniversary of that event celebrated at Philadelphia. So is the birthday of the great patriot and general who led us to independence celebrated. But there is one event, an event scond only in importance to the Declaration of Independence, which has heretofore received not the slightest remembrance. I refer to what is known in history as the Louisiana Purchase, that treaty of purchase in which the greatest Warrior on one side of the Atlantic and the greatest Statesman on the other side, were the most conspicuous figures, whereby there passed to a new born nation a territory that was destined in a century to become greater in wealth and influence on the destinies of nations, than the country which bartered it, for, to quote a well-known writer, "if 1776 declared the independence of our country, 1803 achieved it."

This great event whereby more than 875,000 square miles of territory was added to the United States, their independence and powers assured, has never been acknowledged in any way. School histories do not even mention December 20, 1803, the day on which our flag was raised for the first time over the territory now comprising the States of Louisiana, Arkansas, Missouri, Kansas, Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Montana and Wyoming, Oklahoma and Indian Territories, and the homes of more than twenty millions of happy free souls.

That December 20 has not been celebrated each recurring year has been a grievous fault; to permit the Centennial anniversary of this great blessing of humanity to pass unmarked, would be base ingratitude. But the Centennial will not pass uncommemorated; it will be celebrated with a burst of glory which will reach around the globe and from pole to pole. Every civilized nation of the earth, republics and monarchies alike, will participate in that celebration, and even every uncivilized people will be represented there.



View of Henry County Corn Palace, 1902, Clinton, Henry County, Missouri. By courtesy of H. T. Burris.

To amend for past neglect, our people of the purchase will in one celebration cover the delinquencies of a century. And it is here that Missouri claims the garland of credit. Missourians proposed the celebration, Missouri made the celebration possible.

A few words of history on the inception and promotion of this celebration may not be amiss here:

The first public mention of the duty of our people to celebrate the Louisiana Purchase Centennial, was an editorial written by Mr. W. V. Byers in the Sunday Republic of May 12, 1889.

The question was agitated more or less in the newspapers of St. Louis until, on January 23, 1898, the Central Trades & Labor Union of St. Louis adopted a resolution calling for the celebration of the One Hundredth Anniversary of the Purchase; and on February 5, '98, Congressman Bartholdt introduced in Congress a bill providing for the celebration to be held at St. Louis in 1903.

The Missouri Historical Society, at its meetings in September and November of 1898, appointed a Committee of Fifty to suggest ways and means for a fitting celebration.

At the suggestion of this Committee of Fifty, Governor Stephens issued a call for a Convention to be held in St. Louis January 10, 1899, to consider the question of commemorating the One Hundredth Anniversary of the Louisiana Purchase.

The Committee of Fifty arranged for the convention and the entertainment of delegates. The Governors of all the states in the Purchase appointed delegations, which were represented.

The convention adopted resolutions of sympathy with the project, and appointed an Executive Committee of Fifty, with Governor Francis at the head, to carry the project into execution. This Committee was composed of Missourians and was later increased to two hundred. And the Committee did its work so effectively that on January 1, 1901, the Constitution of the State of Missouri had been amended by an overwhelming vote of the people, allowing the City of St. Louis to subscribe, and it had subscribed:

Five millions of dollars of city bonds.

Five million of dollars had been raised by popular subscription in St. Louis and the State, and

Five millions of dollars had been appropriated by the Federal Government.

Giving the vast sum of fifteen million dollars in hand for the basic work of the celebration.

This sum, fifteen million dollars, is the exact amount paid by Jefferson to the French for the entire twelve States and two Territories, but is hardly one-half the gross sum that will be expended in the celebration of that event.

With these figures in mind, we are prepared to realize the magnitude of this World's Fair, and must meet fully the responsibilities of our position as the World's host. The honor bestowed upon our State in holding the celebration in her borders is a deserved one.

Missouri is the Keystone State of the Louisiana Purchase. She stands pre-eminently at the head of the great political and commercial communities which became a part of the United States one hundred years ago. She is situated not only in the central portion of that vast territory acquired by the purchase from the French, but also in the center of the wonderful Mississippi valley, and is almost the geographical center of the nation.

She stands to-day the fifth State of the Union in population and wealth. We are in our infancy, capable of increasing our products many, many times their present value and of supporting in comfort many times our population.

Our people and our institutions are progressive, and our taxes are as low as any State in the Union. Taxes for State purposes are the lowest of any State, and our bonded State debt is nil.

Under wise, just and liberal administration, State, county and municipal, this great commonwealth during the past thirty years has increased in population, wealth, dignity and importance until to-day she ranks fifth, and now that the time has arrived to fittingly commemorate the one hundredth anniversary of the Louisiana Purchase, what more appropriate place could have been selected for this imposing ceremony than St. Louis, the Queen City of the Mississippi Valley, the peerless metropolis of "Imperial Missouri."

There the flags of almost every nation in the world will pay just homage to the stars and stripes, the emblem of freedom and liberty, unfurled to the gentle breezes in the new born Forest City on the banks of the Father of Waters where the greatest exposition of modern times will stand, a living monument to the unparalleled progress of the arts and sciences at the dawn of the Twentieth Century of Christian civilization.

Missourians are modest, but at the same time justly proud of their birthright in this imperial sovereignty. The greatest of all states west of the Mississippi river, she throws open her marts of trade, commerce and industry, her productive agricultural fields, vast timber lands and rich mineral deposits, for the inspection of visitors from every foreign shore, and invites them to come and partake of her hospitality and share in the wealth of this land of promise and prosperity.

The Commonwealth of Missouri represents a type of the most advanced class of modern civilization. It stands for all that is inspiring in higher education and noble and elevating in political freedom and religious liberty. The State is distinctly American and her people noted for those strenuous habits and progressive characteristics which are essential to the success and welfare of every community.

Our educational and eleemosynary institutions are of the highest order. The public school system is unsurpassed by that of any in the country. It has been wisely and judiciously administered and many of its features have been studied and reproduced in the systems of older States and those of several foreign countries. There is no place in the world where a child can obtain a better free education. The hills and vales, hamlets and villages of the State are adorned with school houses while the larger cities have reared structures so grand and imposing that many of them are pointed to with pride and admiration by the leading educational instructors of the country.

The penal institutions of Missouri rank with any in the United States, and so well and effectively have they been conducted, and so justly and fearlessly have the laws been administered, that all outlawry and crime of a serious nature have been stamped out. There is no State in the Union to-day which is freer from crime, or in which the personal and property rights of the citizens are better protected, or her laws more vigorously enforced.

Co-incident with this, the substantial progress and development have been marvelous. A web work of steel rails connects the various centers of commerce, trade flourishes, crops are bountiful, products of the mines abundant, and capital receives the rewards of judicious investment, while labor reaps the harvest of thrifty toil and endeavor.

The geographical location of Missouri gives the State unusual advantages from a climatic standpoint. Bordering the heavily timbered sections of the Mississippi valley and the broad expanse of western prairie lands it partakes of the conditions peculiar to both. The mean annual temperature is about 55 degrees, varying from 33 degrees in winter to 76 degrees in summer. As a rule, the winters are moderate, even mild, and accompanied with light falls of snow. There are no long storm-locked periods, no frozen cattle, no scarcity of food or fodder. The thrifty and judicious farmer has nothing to fear for his horses, cattle, swine, sheep or poultry during the winter season.

In summer the weather is seldom hotter than in the lowest tier of northern states, while during the spring and autumn the most ideal conitions prevail. The rainfall will average about forty-one inches for the year, while a season of prolonged drouth has been known to occur once in twenty years and then it was generally throughout the western country. The sunshine which prevails to an unusual extent at all seasons of the year, conduces not only to the health of all animal life, but insures the best results and conditions in the agricultural and pastoral regions. Crop failures are almost unknown, and the devastation of cattle by diseases which prevail in less favorable climates, are unheard of in Missouri.

The prevailing winds are from the south and southwest in summer, but are so evenly tempered by the high ranges and timbered lands of the Ozarks that they are nearly always refreshing and cool. Those from the southwest, west and northwest frequently bringing with them the rain and thunderstorm, but not more than once in a decade do they approach the celerity of a tornado. In the winter the variation is even less marked; the winds from the north and northwest are keen and bracing, bringing frequent snow flurries and occasional heavy falls of snow, but the blizzard is as rare a factor in Missouri climatic conditions as the tornado or cyclone, so prevalent in states further north and west.

What greater inducements can be offered the farmer than a climate where the productive soil revels in the sunshine of an even tempered summer, followed by a short, mild and open winter, and with a rainfall of 41 inches, our climate is a dry one. While showers are heavy, rainfalls frequent in certain seasons, the moisture is rapidly absorbed. This is due to the undulating surface of the soil so peculiarly characteristic of Missouri land.

The soil of Missouri has always been noted for its productiveness, and the homeseeker is assured that honest labor and industry will invariably produce a remunerative crop, whether of grain, fruits, vegetables or even cotton.

The State has in all 42,625,600 acres, the greater part of which is peculiarly adapted to agricultural and horticultural purposes, and offers promising inducements for farmers who will combine economy with industry.

The State Board of Immigration sums up the resources as follows:

"Missouri fruit crops surpass those of Florida. South Missouri is the land of big red apples.

"Missouri mules and horses are finer than those of Kentucky. In the production of poultry she leads the world.

"There is more coal in Missouri than in Illinois; more iron than in Pennsylvania, more building stone than in Vermont. The output of lead and zinc is worth more in one year than all Colorado's mined silver.

"It is essentially the land of wild grasses and the adopted home of the famous blue grass.

"In agriculture it is the garden spot of the universe. In summer a land of growing crops and delightful air; in winter, fat herds, full tables and bright firesides."

In other words, Missouri is a part of the garden spot of the west. Its fertility and resources are unsurpassed by any similar area on the American continent. The market value of the land, when its productiveness is considered, is far below that in other States. Transportation facilities to the great markets of the world are unexcelled, with such natural gateways by rail and river routes as St. Louis and Kansas City, no State in the Union is more favorably situated for continental travel. More railroads and steamboat lines center at these two points than at any metropolitan center west of the Alleghany mountains. St. Louis is known to the world as the "Solid City;" the bonds of the State of Missouri, as well as those of the City of St. Louis, are floated on the markets of America and Europe on the same per centage basis, and almost the same identical basis as United States Government bonds. In other words, the credit of Imperial Missouri at home and abroad is as good as that of the National Government. Her State debt has been practically wiped out, and no commonwealth in the Union enjoys greater immunity from taxation. Figures will show that property owners and citizens of Missouri generally, pay less taxes per annum than the citizens of any State in the Union.

Missouri, for a greater part, is an agricultural State with a large amount of lands that have never been cultivated, never been subjected to the keen edge of the plow, never been tilled.

Many farms to-day are not worked to their full productiveness because of a lack of up-to-date methods. While this may seem strange, it is nevertheless true.

The population of Missouri has gradually increased from the hundreds of thousands into the millions. Statistics have shown that nearly one-half of the adults of the State, engaged in active business and commercial pursuits, have become rich from the soil.

Agriculture predominates over the other industries and appears to hold out surpassing inducements to those who wish to engage in it—the stock raiser, poultry raiser, dairyman, fruit grower and the miner. Its cities, towns and villages are rapidly filling up, and farm lands are gradually being brought under a higher degree of cultivation. All the cereals of the western and northwestern states, as well as the fruits, grains and vegetables of the south attain a degree of great perfection in Missouri. Our wheat makes most excellent flour and ranks high on all markets; corn crops are always assured and attain a high degree of perfection while our fruit lands rival those of California.

A man with moderate means can locate in Missouri, buy a good farm, enjoy all the advantages of modern social community, on payment of less taxes than he can anywhere else in the United States. Figures and statistics will prove each of these assertions.

The soil and climate makes this locality the natural home of all nutritious grasses. Blue grass, which has made certain sections of Kentucky famous, has been found to be particularly adapted to the soil of Missouri. It grows spontaneously wherever it is left free from the plow. But Missouri does not depend alone on its blue grass. It grows other varieties equally nutritious and as valuable for pasturage, also possessing the advantage of being cut and dried for hay. Orchard grass, timothy, red top, alfalfa and clovers thrive in the soil. Missouri hills are as rugged as the Highlands of Scotland and her valleys as fertile as those of the Nile, where can be grown in abundance everything needful to mankind.

Dairying in Missouri has been successfully tested. Milk, butter and cheese are produced at a minimum cost, and while the country possesses more natural advantages for dairying than New York, it is equally well situated in close proximity to large markets for these products as the Empire State. St. Louis on the east, Kansas City and St. Joe on the west, with scores of smaller but well populated cities in the interior, all connected by intersecting lines of our great railway systems.

The same conditions which prevail for the successful raising of cattle and dairying, apply to the wool growing industry. There are no devastating blizzards, no enervating spells of excessive heat and drought, no epidemics, to decimate the flocks.

The coal deposits of Missouri have been estimated to be sufficient to supply the demand of adjoining communities for centuries. A territory comprising twenty thousand square miles of the State's surface covers these deposits. Extending from Clark county in a southwesterly direction down through the State to the Indian territory, there are extensive coal fields in nearly every county northwest of such line.

Coal mines have been worked with apparently but little effort, without the use of expensive machinery, deep shafts being found to be necessary. The coal is bituminous in character and of good quality. In more than a thousand places along the lines of railroad, these coal deposits have been tapped and furnish the greater part of the fuel used for commercial and domestic purposes.

The iron deposit of Missouri are too famous for lengthy comment. Ore has been found in some sections in such vast quantities that it has been roundly estimated it would supply one hundred furnaces for one thousand years.

What has been said of iron applies with equal force to the lead and zinc deposits of Missouri. The famous "Joplin District" in southwest Missouri is known the world over wherever lead and zinc stocks are put upon the market for investment or speculation. Millions of dollars worth of the product of these ores have been sold at home and abroad during the past decade. During the recent Klondyke gold fever, actual figures were produced to show that the yield in dollars and cents from the lead and zinc mines of Missouri, for corresponding periods of two, three and four years was greater than that from all the shining metal mined in Alaska.

The district in which lead mining has been carried on for the greatest period, lies in southeastern Missouri, and the production in that part of the State has been enormous for many years, from which profitable revenues have been derived.

Fully three-fourths of all the zinc used in the United States has been mined in Missouri. This may be a startling statement to many, but to those familiar with the facts it is known to be true.

Down in the southwest corner of the State, in the vicinity of Joplin, Webb City, Carthage and Aurora, the deposits of zinc appear to be exhaustless. This section has been styled the "Klondyke of Missouri," but unlike the famous gold bearing region in the ice bound fastness of Alaska and British Columbia, it has attained an enduring reputation as one of the greatest ore producing centers in the world. The mineral deposits as stated, appear to be exhaustless, and though the mining industry is practically in its infancy, the products have been yielding annually eight to ten million dollars.

In comparison with the zinc, lead and iron deposits, those of copper are limited and confined to a few districts. Yet it must be said that copper mining in Missouri has never been put to a thorough test.

The building stones of Missouri have attained a high reputation in recent years and some of the large quarries are now known in every section of the country. The granites, marbles, sandstones and limestones are of excellent quality, and have been tested thoroughly in many of the handsome buildings and structures of this and adjoining states. The granites have been pronounced by experts to be unexcelled by those of Vermont, or of any other State in the Union. The granites are not only solid and beautiful for buildings, but several of them have no equal in the world for street paving purposes. The red and grey species are particularly attractive, and furnish huge boulders, handsome and massive pillars, polished slabs and stones, for every useful and ornamental purpose in the architect's and builder's lines.

Missouri has some of the finest undeveloped onyx beds in the world. The finest rough and pressed brick are manufactured from the fire clays abundant in many sections of the State.

The manufacture of plate glass is one of the distinctive industries of the State. Our plate glass factory in Southeast Missouri has a reputation that is worldwide. Deposits of kaolin, potter's clay, tin, nickel, cobalt and magnesium are found in certain sections in paying quantities.

It is difficult to determine whether Missouri's greatest wealth lies in her land-locked vaults and hidden recesses, or in the fruitful crops which the thrifty toiler produces from her rich and sun-kissed soil.

While Missouri and Missourians have done their full duty to the sentiment of the Fair, in providing it with funds and fountain head, there now remains a greater duty to be done—that of placing our Imperial State fairlry before the world.

I have told you a part only of what Missouri has done toward this great enterprise, and of her possibilities and natural resources, the many natural advantages she possesses from political, business, religious, social and educational standpoint. There is also a practical side to this question—to demonstrate these possibilities to the public is the difficult task we have before us.

Knowing the unexcelled resources of our State and realizing the opportunity presented by this exposition for making these resources known to the world, and reaping for themselves the profits of increased demands for our lands, our stock, our crops and our minerals, the people of Missouri by a practically unanimous vote, authorized the Legislature to appropriate one million dollars for the purpose of properly exploiting Missouri before the world.

This the Legislature has done and through the Governor, has appointed a commission of nine, of which I have the honor to be president, to assemble the exhibits for display.

To do justice to the State—and justice will be done—is a Herculean task. We commissioners are but servants of the people, and in this important work must have the unstinted assistance and co-operation of every loyal Missourian.

Our breeders produce finer horses, mules, cattle hogs and poultry than any State in the Union. With your co-operation, breeders, we will demonstrate this to the world—making the brand "Missouri bred" on any animal an accepted guarantee of its superiority.

Our apples, berries, peaches and vegetables have first call in every market where they are known. With your assistance, growers, we will make them known in every market of the country.

Our farms and rural communities afford the best homes and most profitable farming in the country. Our lands offer better investments and surer returns. With your assistance, farmers and land-owners, we will make these facts known to the crowded agriculturalist of the east, the blizzard-tossed farmer of the north, and the drought-ridden struggler of the west—increasing the demand for and value of every acre of tillable land in the State.

Thus, too, shall we make known to the world that while we produce three-fourths of the world's output of zinc, of the forty counties underlaid with zinc ore, the mining thereof is extensively followed in but five or six, and even in these exceptional opportunities for investment are offering.

Government tests and reports shows our quarries produce the finest building stone in the country, but this fact is scarcely known outside of the State. We must demonstrate it to the world.

With the support of loyal Missourians, we will bring to the attention of capital the vast deposits of glass, sand, onyx, coal, iron and other commodities, awaiting only the touch of enterprise and capital.

In gum wood, which grows and is milled only in this State, is the greatest substitute for mahogany. This, with our other lumber interests, must be exploited fully.

In health and pleasure resorts we rival the seashore. To insure popularity and patronage for these, the world at large need only know of the health-giving properties of their waters and air; the facts we will make known, with the proper assistance of those interested.

Our great educational institutions must be fully exploited and our wonderful public school system fully exemplified. To do this successfully we must have the assistance not only of the educators of the State, but of all those interested in education.

I might go on citing fields wherein specific benefits will be derived by our people and the State from this exposition, but have already occupied more than my allotted time.

Perhaps a word of explanation is due as to why no greater progress has been made to date by the Missouri Commission.

Very soon after the Commission was first appointed, they began to arrange for the preliminary work and had accomplished a great deal along this line, when it became apparent that the Fair would of necessity be postponed. We then deemed it wise to postpone further work for the time being.

We have now again actively taken up the work, and in a short time all preliminary arrangements will be completed, heads of departments appointed and active work begin in earnest. The Commission from this day forward will endeavor to push the work vigorously to the end, so that when Missouri's exhibit shall be installed with the co-operation of the various societies and those interested in Missouri's welfare, and the fair opened, the result of our efforts will meet the approval of our people.

I want to remind you all of one thing before I close, and that is that no matter how hard the Commissioners may labor, no matter how earnestly and faithfully they endeavor to perform their duties, after all success rests upon the co-operation of all the people, and we especially desire that every Missourian feel that he is a part and parcel of this great undertaking, and that the Commissioners will at all times welcome any suggestions or ideas that you have to present.

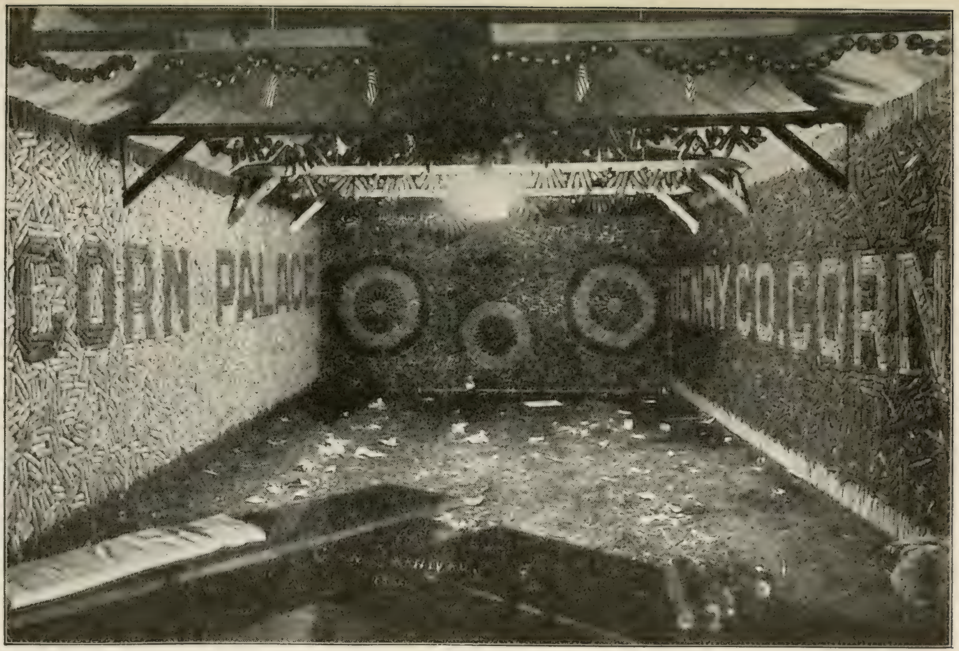
The office in St. Louis is open, where all correspondence relative to "Missouri at the Fair" should be addressed, and where it will receive earnest consideration. And we extend to the people of the State a hearty welcome and invite their hearty and earnest co-operation in our work.

MISSOURI LIVE STOCK AT ST. LOUIS WORLD'S FAIR.

(By Hon. N. H. Gentry, Sedalia, Mo.)

That the Louisiana Purchase Exposition to be held in St. Louis in 1904, will prove the greatest the world has yet seen no well informed person doubts. It is laid out on a much broader scale than any of the past, covering I believe, in area between eleven and twelve hundred acres. whereas the Columbian at Chicago in 1893 of which all America was so justly proud, covered between six and seven hundred acres. It will excel not only in size any world's fair of the past, but it will embrace more departments and a greater variety of exhibits. The world moves in more than one sense and especially is this true of the immediate past. The pace is quickening at every step. New and important inventions and discoveries not dreamed of at the time of former expositions will be there on exhibition. There the civilized world will meet and no doubt more or less of the less civilized, and learn from each other. Nations in greater numbers no doubt than ever assembled together on any former occasion will be there within the borders of our own great State and vie with each other in one great united effort to educate and better the condition of mankind.

Missouri is singularly fortunate that this great exposition is brought to our very doors and no Missourian be he man, woman or child of appreciable age should fail to embrace the opportunity of a life time by


CORN PALACE
..NRY CO. CORN

Interior view of Henry County Corn Palace 1902. By courtesy of H. T. Burris.

attending. The advantages there offered for learning will be unequaled and if intelligently made use of an education so to speak can be much more easily and rapidly gained than by reading or traveling. Instead of having to visit the different nations of the earth at great distance and expense they will be here assembled for the common good of all. We should be the more proud of this greatest of all expositions for the reason that it has been brought into existence largely by Missouri energy, intelligence and money with one of our most gifted and beloved Missourians at its head backed up also by a loyal sisterhood of states. Here on Missouri soil occupying almost the exact center of our Union the North, South, East as well as the unequaled West, will be assembled together welcoming with one united outstretched hand, the nations of the earth in friendly rivalry to take part in this mighty effort to enlighten the world. We will learn from them and they, no doubt, from us. In this effort Missouri will be a central figure and much will be expected of her. With her million dollar appropriation, I believe she will prove equal to the occasion but not without much thought, hard work and sacrifice of time from personal business on the part of the Commission upon whom rests the responsibility of making the exhibit of our State. As a member of that Commission I can truthfully say I feel the weight of this responsibility and I am certain every member feels the same.

Of the Missouri live stock exhibit in particular am I expected to speak. That she will here do her part well I can say without boasting that I haven't the slightest doubt. There is no way by which we can judge the future with more certainty than by the past. In both national and international shows of live stock in the past Missouri has led in several lines of live stock, notably so in cattle, hogs, sheep, light horses, jack stock and mules. And who is it in this enlightened age that has not heard of the Missouri mule? The Hon. Champ Clark has well said that in the war between this country and Spain the Missouri boys started for the front and but few of them got there, but the Missouri mule was in it from start to finish. His superiority seems to be recognized the world over and by thousands he journeyed as far as South Africa and materially aided our English Cousins in conquering the gallant Boers.

At the Chicago World's Fair I saw a Missouri exhibit of fine wool sheep win three-fourths of the first prizes, to say nothing of lesser prizes he won. This exhibitor was none other than the late L. E. Shattuck of Stanberry, Mo., and he had for competition a very large exhibit of the very best the world could produce. The further eastern states for more than half a century looked upon as the home of the fine wool sheep were there in all their old-time glory but went down in defeat under the weight of the Missouri genius. I have heard many well posted stock breeders say that he was the greatest breeder of fine wool sheep of his day.

Mr. Wallace Estill, of Estill, Mo., was equally as successful at the same show with his exhibit of Aberdeen Angus cattle and I could name other Missouri exhibitors of live stock who were equally as successful with other kinds of live stock.

In the late national shows of Shorthorn and Hereford cattle I have frequently seen Missouri come out of the hottest kind of competition with the first three, four or maybe first five ribbons and on one occasion I call to mind a case where Missouri exhibitors won the first seven prizes of the eight given in a class of very strong competition representing several states in which were left more than double that number of animals that did not gain a position.

In St. Louis in 1904, will no doubt be gathered together the greatest live stock show by far that the World has ever held. I have heard this prophecy many times from the lips of well posted stock breeders within the last eighteen months while I have not heard a single one dispute the correctness of the prediction.

Some ten years ago I read in a leading English live stock journal a re-printed speech of the great Gladstone, delivered, it was said, thirty years previous to that time, before The Royal Agriculture Society of Great Britain in which he said that farming in connection with live stock breeding afforded the largest field for the development of the human mind of any profession known to man. The breeding and developing of the best specimens of our improved live stock has ever been regarded by the intelligent student as a science of the highest order. As in any other avocation of life many who attempt to master its mysteries fail where one succeeds. I am not given to boasting but I have faith in the skill, energy and pluck of our Missouri breeders as compared with the like qualities of those from other states or countries and I am here to say that when the history of the live stock show of the Louisiana Purchase Exposition shall have been written I am sure the names of Missouri breeders will be found well to the front.

THE IMPORTANCE OF SHOWING AS WELL AS BEING SHOWN.

(By Hon. J. O. Allison, New London, Mo.)

We are about to commemorate a great event.

We are a celebrating people. We celebrate our birthdays, our wedding days, the lives of our great heroes, and statesmen, and the great historic events of our nation. We love to gather at the old homestead, and celebrate the birthdays of our fathers and mothers, and review the sacred scenes of the old home and boyhood days, and "dream the old dreams over again." The old soldiers gather at Gettysburg and Chickamauga, and around the camp fires, and on the sacred battle fields, pay tribute to the memories of the sacred dead. As the years come and go, the American people, with high patriotic purpose, gather togther, on the Fourth day of July, and twine anew the laurel wreath, and again crown our nation's glory. Pageantry, pomp and ceremonials, have ever held a place in the lives of civilized people.

It is more befitting, that in the beginning of the twentieth century, we turn from the achievements of military heroes, and the pageantry of war, to celebrate the great victory of peace; the mighty achievement of statesmanship; the acquisition of the Louisiana Territory; the great land transaction between Thomas Jefferson and Napoleon Bonaparte; the greatest real estate deal since the time that God created the world, and pronounced it good, and quit-claimed it to the human race, and put them in possession in the flowery and fruited Garden of Eden.

Great deeds must have great occasions; great results must have great causes; great poets have great themes; great historians have great subjects. Milton had Paradise, Shakespeare had Humanity, Jefferson, in writing the Declaration of Independence, had the "inalienable rights of man." The Columbian Exposition at Chicago, had the birth of a Republic. An Exposition, in order to be successful, must have a great event to commemorate, such as will create an enthusiastic interest and zeal in the enterprise.

The first thing of importance, therefore, in the discussion of the great Exposition, to be held in St. Louis in 1904, is to consider, understand, and appreciate, the great magnitude and far-reaching effects of the event we are about to celebrate, and review the causes that lead to its consummation. To do this without the mention of Napoleon Bonaparte, would be like a marriage without a bride, or Shakespeare without a Hamlet.

One hundred years ago, the Old World was completely dedicated to monarchies. By the acquisition of the Louisiana Territory, the New World was dedicated to Republics. A few years before the acquisition of this territory by the United States, the American Colonies had gained their Independence, and established the little republic, along the west shore of the Atlantic. This little nation owned the sea-board, from Maine to Georgia, extending westward to the Mississippi river; the mouth of this great river, and the entire west bank, was owned and controlled by nations, unfriendly to the United States. This new and growing republic was made up of sturdy, pioneer and patriotic people who sought to establish a government based upon the eternal principles of human rights. But they were circumscribed; they needed an arena, suitable to their objects; they needed a foundation, upon which to build the magnificent superstructure which we now behold, as the great American Republic.

At this time the Old World was in the throes of war. The nations of Europe were trembling under the military power and genius of Napoleon. His ambition was to dominate the East. Germany, Austria, Spain and Egypt submitted to his imperial power, and the hosts of Russia gave way before his invading armies. He was successful everywhere, except when he met the British troops; England was his greatest rival, and his most dangerous foe. England was then, as now, a great commercial nation, and Napoleon resolved to cripple her commerce, by cutting off her trade with the nations of Europe and Asia, so far as he could control those which had come under his dominion, and by aiding the establishment of a commercial rival in America, and thus deplete the treasury of England, so that he would some day be able to meet her in successful combat. It was with this purpose, that he conveyed to the United States for an insignificant consideration, the vast Louisiana Territory.

Just before Napoleon made this conveyance, and while discussing it, he said: "To emancipate nations from the commercial tyranny of England, it is necessary to balance her influence, by a maritime power, that may one day become her rival; that power is the United States. The English aspire to dispose of all the riches of the world. I shall be useful to the whole universe if I can prevent their ruling America as they rule Asia."

And again, it is authentic history, that just after the transaction was completed, by which the Louisiana Territory was transferred to the United States, that Napoleon said: "This accession of territory, strengthens, forever, the power of the United States, and I have just given England a maritime rival, that will sooner or later, humble her pride."

With what prophetic vision did Napoleon look one hundred years into the future, and unfold the coming events! Read the story of American commerce of today. It is written everywhere. Today the United States is the commercial rival and competitor of England. Behold our navy, the pride of America, and the admiration of the world, and our Merchant Marine, carrying our commerce to all parts of the earth! See the products of our farms and factories and mines, exported to all parts of the world, coming in competition with like products of Great Britain and other nations; hear the jealous mutterings of Germany, and Russia, in their attempts to exclude the importation of American products. Hear the demand of the United States for the "Open Door," in China, and a share of the trade in the Orient. Yes, look at the vast annual shipment of horses, mules, hogs, wheat, hay and corn, from this very Louisiana Territory to England. She cannot carry on her wars, nor feed her people, without the aid of American commerce.

The Fifteen Million Dollars, consideration, for this transfer, was not the primal and moving cause with Napoleon. His published statements show, that he well knew it was a mere pittance, compared with the value of this vast domain. It is a mistaken belief that Napoleon did not have a fair conception of the magnitude and resources of the Louisiana Territory. He saw in it, at the time he ceded it to the United States, the resources and possibilities, of a rising commercial empire.

Napoleon, in the transfer of Louisiana to the United States, performed the one act of his strenuous life, which has stood the test of time; of all of his mighty achievements, this alone has borne fruit. Germany, Austria, Italy, and Spain no longer bend the knee; his magnificent military exploits are only remembered in the dimness of fading history. Where are the fruits of his great battles? What glory comes to him from Austerlitz, Marengo and Waterloo? Who is made better by the exploits of his wonderful military genius? Over his grave the poet sang—

"He sleeps his last sleep; he has fought his last battle,
No sound can awake him to glory again."

If any sound could awaken him it would not be the sound of war trumpets, but the hum of peaceful industry in the Louisiana territory. If any sound could awaken him, it would not be the victorious shouts of a triumphant soldiery, or the flattering speech of subject monarchs it would be the glad shouts of eighty million of free Americans; it would be the voice of humanity rejoicing, that by the stroke of his pen, he made possible the development of this great nation, the champion of human rights and human liberty. By his sword, he failed to make the French Empire co-extensive with the bounds of Europe, but by his pen, he made possible, the great American Republic of today. For his military achievements, he was doomed to perish upon the barren rocks of St. Helena. It has been well said of Napoleon—

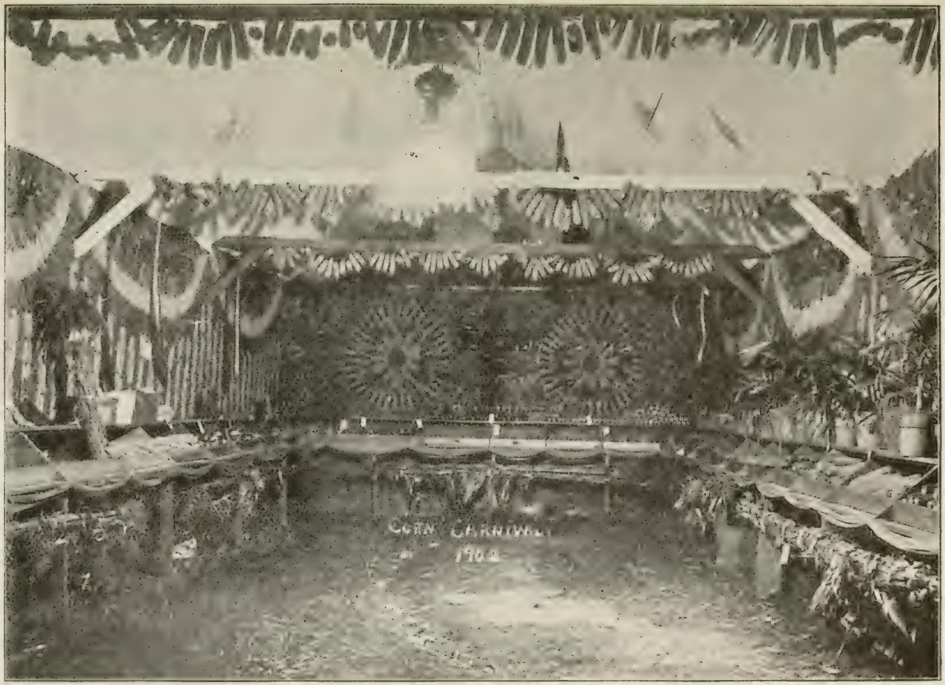
"He perished by his sword,
By his pen he won immortality."

When I view this magnificent Louisiana Territory, I can not help but think, what a miserable failure Satan made, when in ancient times, he undertook to make an exhibit—when he took the Savior upon the mountain, and showed him all lands and kingdoms "round about," and offered to cede to him all of the lands and kingdoms, as far as the eye could encompass, if the Savior would fall down and worship him. What a mistake Satan made as usual! If he was really going to tempt the Saviour, why didn't he show him something good? Why didn't he abide his time, and show him the Louisiana Purchase? Instead of going upon the little mountain near Judea, why didn't he take him upon the dizzy heights of the snow-capped Rocky Mountains, where they could see something? Instead of showing him the River Jordan, why didn't he show him the mighty Mississippi and Missouri rivers? Instead of showing him the Hills of Judea, why didn't he show the great Mountain Ranges of the Louisiana Purchase? Instead of showing him the "Land of Canaan," why didn't he show him the land of Missouri? If he had shown the Savior all these things, nothing but his Divine nature would have enabled him to withstand the temptation, and impelled him to render that well deserved rebuke: "Satan, get thee behind me, for it is written, thou shalt worship the Lord thy God."

By the Louisiana Purchase the United States more than doubled its then existing area, and added a domain, greater than the combined area of England, France, Germany, Italy, Spain and Austria; out of which was carved the States and Territories of Louisiana, Arkansas, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Kansas, Nebraska, Colorado, Wyoming, Montana, Oklahoma and the Indian Territory. The acquisition of the Lousiana Territory, led to and made possible the acquisition of the vast regions west of it, composing the States and Territories of California, Oregon, Washington, Idaho, Nevada, Utah, Texas, Arizona and New Mexico; for without the Louisiana Purchase all of this country lying west of it, would have been segregated from the United States by an intervening foreign power, which, perhaps, would have made the acquisition of that vast region west of the Louisiana Territory, both impossible and undesirable.

The Louisiana Purchase led to the Monroe Doctrine, because, with foreign powers occupying three-fourths of the territory now occupied by the United States, and controlling the Gulf of Mexico, and the Missouri and the Mississippi rivers, President Monroe would never have conceived, nor dared to promulgate the great American principle, known and cherished as the Monroe Doctrine.

It is of the highest importance, that we celebrate this historic event, that marks the summit of Napoleon's fame, and crowned the glory of



Interior view Henry County Corn Palace, 1902. Clinton, Henry County, Missouri. By courtesy of H. T. Burris.

Thomas Jefferson, and re-enforced humanity, in its work of human progress. Measured by the vast area of the Louisiana Purchase and its wonderful resources; measured by the personnel of the two great characters who were its authors and finishers, Napoleon, the greatest soldier of the East, and Jefferson, the greatest statesman of the West; measured by the far-reaching effects upon the human race; it is one of the greatest events, in the history of the world. As the handiwork of Jefferson and Napoleon, it could not be less than great. We will commemorate it by the greatest World's Fair the world has ever seen.

Of all the states and nations preparing for this great international show, Missouri should be the best prepared. Missourians, "have been shown," so long, they are now ready to make a great show; we have had a long and varied experience and training in the show business. Every Misourian delights in being shown; in fact he "has to be shown."

It is very important for Missouri to show, because she has so much to show, such varied and magnificent products to display. Missouri, with its rolling prairies, fertile valleys, mighty forests, majestic rivers, and rich mineral deposits, abounds in material wealth unsurpassed in all the sisterhood of states; Missouri, with its queenly cities, splendid railroads, vast manufacturing and business industries; with its rich fields of undulating soil, where corn, wheat, oats, cotton and hay grow and ripen in luxurious gradeur; with its exhaustless mineral beds, where coal, lead, zinc, and rock, lie sleeping in the earth and mountains of iron await the blazing forge; with its vast expanse of orchards covering its hills and valleys, as far as the eye can see, flowered and fruited, in matchless richness and beauty, with the apple, peach and pear; with its great stock industry of splendid cattle, horses, mules, hogs and sheep, which easily win the laurels, in the best prize contests of the land,—commands the admiration of the business and industrial world.

Missouri, with its mountains and valleys, and prairies and rivers, and forests and landscapes; where the grass grows and waves before the wind like the billows of the sea, and the flowers of every hue and clime, bloom and fill the air with fragrance; where the birds of every note and plumage, from morning till night, wend their merry flights and fill the day with song—pleases and charms the most æsthetic taste.

Missouri, with its magnificent educational system, with its schools and colleges and churches, where thousands of Christian homes dot the hills and plains and cluster by the rivers, attracts the admiration and delight of the most educated, cultured and refined. Missouri, with its millions of intelligent, God-fearing, educated, patriotic, liberty-loving people, with its varied and boundless resources, is the greatest State in the Union.

Such a State with its million dollar appropriation, deserves, demands, must have, and will have, the best exhibit at the St. Louis World's Fair, that was ever displayed to the gaze of an admiring public, by any state or nation.

AGRICULTURE AND HORTICULTURE AT THE EXPOSITION.

(By Professor John T. Stinson, Superintendent of Pomology, Department of Horticulture, World's Fair.)

Ladies and Gentlemen:

I am here to meet you in the place of Mr. F. W. Taylor, Chief of the Departments of Agriculture and Horticulture of the World's Fair, who is on the program, but unluckily for you he is in New York and it is impossible for him to be here.

I am not going to attempt to make such an address as Mr. Taylor would make, for he is an Exposition man and would take up this subject in a thorough and comprehensive manner. I desire to say, however, for the encouragement of all of you who are interested in seeing Missouri make the finest exhibits in the Departments of Agriculture and Horticulture that have ever been made at any Exposition, that you will find that Mr. Taylor will do everything in his power to assist those directly in charge. He has had a large amount of Exposition experience, covering the World's Fair at Chicago, and the Expositions at Omaha and Buffalo.

It is not necessary for me to attempt to give facts concerning the general scope of the Exposition, as the members of the different societies here represented are probably well acquainted with the general plan of the exposition. It is well known that this exposition is planned on a much larger scale than was the Columbian Exposition at Chicago. When it is realized that the exposition grounds extend two miles in one direction and one mile in the other, some idea of the extent of this great exposition is obtained.

The largest building on the grounds will be the Agriculture building which will cover practically twenty acres. This is evidence of the recognition by the exposition officials of the importance of the agricultural industry.

Some of the other large buildings are the Transportation building, which will cover over fifteen acres, the Machinery Building, which will cover over ten acres, the building devoted to the Varied Industries, covering over ten acres, and the Manufactures building covering practically thirteen acres. These are some of the largest buildings, while there are a great number of buildings covering from four to ten acres.

It is certainly gratifying to the agriculturists of the State to know that the largest building of the exposition is the Agriculture building, and that it is naturally expected that Missouri will occupy a large amount of space in this building with her great exhibit of Agricultural products.

The Horticulture building will cover about five and one-half acres. In this building will be the Pomological exhibit, covering a space of about four acres. This is about twice the amount of space that has ever been devoted to a fruit exhibit and besides it is all to be in one large room, which will add much to the value of the exhibit.

The arrangement of the exhibit will be such that the whole exhibit space can be seen from certain locations in the building. In addition to the space to be devoted to the fruit exhibit, one wing of the building will be devoted to a large floral exhibit, which will be filled with rare and beautiful greenhouse plants from all sections of the world. The other wing will be taken up with the Horticultural machinery exhibit, and a part of the space will also be devoted to cut flower exhibits which will be made from time to time.

The space surrounding the Agriculture and Horticulture buildings, covering an area of forty acres, will be under the Department of Horticulture and exhibits of every known tree, shrub and plant will be exhibited here in quantity.

It is expected that a comprehensive nursery exhibit will also be made on these grounds.

One of the features of the exposition, and that will be an improvement on former expositions, and one that will appeal to you all, is that an effort will be made to have live exhibits in every department where it is possible. Thus the plan to show processes as well as products, and the great value of this plan, from an educational standpoint will be realized by all. This plan will be followed in the Department of Agriculture as well as in other departments. In this department will be shown the application of the machinery to the products of the soil by having all of the machinery used in connection with the product in actual operation. For example, wheat: All of the machinery used, such as binders, threshing machines, fanning mills and a flouring mill, will be in actual operation. In addition to this, the finished product as it comes from the flouring mill will be used by the bakery which wishes to supply bread to visitors on the grounds. In addition to this, cotton gins will be in operation as well as a cigar manufacturing plant, and, in fact, the processes of manufacture of all agricultural products will be shown where it is possible to do so.

The value of collective exhibits cannot be overestimated, and I am pleased to quote from a recent statement made by Mr. F. W. Taylor, Chief of the Department of Agriculture, concerning this particular subject: ,

"The chief way in which it is intended to improve upon the methods of other expositions, in the Department of Agriculture, will be in the showing of a number of the various agricultural products in such a way as to make possible their study each by itself. Take, as an instance,, corn: An exhibit will be installed to consist entirely of this one product; it will show every variety of corn from all parts of the world where it is possible to grow this cereal. Every known product of the corn as a plant or as a fruit will also be shown, together with illustrations of the uses to which the products may be put. In this way may be presented all those articles which are made from the stalk or pith. The products intended for human food will be shown, as well as those products which are intended for animal food.

"There will also be presented such products as glucose, alcohol, oil, starch, and all the other things which are manufactured from this widely adapted cereal.

"It is believed that this method will enable a visitor to get a much better idea of a great number of uses to which corn may be put than could possibly be afforded if it was necessary to go to a score of state exhibits to find them.

"In much the same way as is described for corn will be treated such other products as cotton, tobacco, etc. These exhibits are intended not to take the place of but rather to supplement the usual exhibits by states or counties.

"It is believed that this method of bringing together the leading items included in the department will prove one of the features of the exposition."

It is probable that the classification of the Departments of Agriculture and Hortuculture will be of some interest to members of the societies here represented, therefore, I desire to mention some of the particular points connected with the classification.

Under Farm Equipment will be shown the different systems of farming, plans of farm buildings and the buildings connected with farming operations.

Agricultural implements and farm machinery will be shown in the Agriculture Department. These will include all implements and machines used in the production and manufacture of agricutural products.

With tobacco the equipment, processes and products will be shown, which will include the raw material, leaf and seed and the manufactured products.

Under Appliances and Methods Used in Agricultural Industries, will be shown such establishments as dairies, creameries, oil mills, etc.

Under Vegetable Food Products and Agricultural Seeds will be shown the different grains as they are harvested in the field, and their products after manufacture.

Under Animal Food Products and meats of all kinds, including refrigerated meats, fittings and appliances for testing, separating and preserving milk and like products.

The group styled "Equipment and Methods Employed in the Preparation of Foods" includes a vast number of products, consisting of flour mills, bakeries, freezing machines, canning factories, sugar refineries, distilleries and various industries for the preparation of foods.

In addition to these will be shown, under another group, Insects and Plant diseases, a systematic collection of insects and vegetable parasities of plants; also the appliances and processes used in destroying injurious insects and preventing loss from plant diseases.

Under Horticulture: Appliances and Methods of Pomology, Viticulture, Floriculture and Arboriculture, are classed all the tools used by gardeners and nurserymen and those interested in like pursuits, also greenhouses, different methods of heating the same, etc.

The Appliances and Methods of Viticulture will be shown by buildings used in connection with this work, implements used in the culture of the vine, collection of vines, all appliances for vineyards, wine sheds and cellars. The methods of wine making will be shown, as will the diseases of the vine and best methods of preventing them.

Pomology consists of the following: Pomaceous and stone fruits; apples, pears, quinces, cherries, plums, peaches, apricots, nectarines, etc.; citrus fruits, oranges, lemons, limes, shaddocks, pomelos, etc.; tropical and subtropical fruits; pineapples, bananas, guavas, mangoes, tamarinds, figs, olives, sapodillas, etc.; small fruits; strawberries, raspberries, blackberries, dewberries, gooseberries, currants etc.; nuts, almonds, chestnuts, filberts, pecans, hickorynuts, walnuts, etc. Casts and models of fruits in wax plaster, etc.

The exhibit of Trees, Shrubs, Ornamental Plants and Flowers, consists of ornamental trees, seedlings or grafted, plants for the park and garden, herbaceous plants grown in the open ground, such as chrysanthemums, dahlias, etc.

The Plants of the Conservatory will show specimens of the culture used in different countries and forced culture of vegetables and fruits;

specimens of products; plants for houses of moderate temperature; plants for hot houses, etc.

Under the group comprising Seeds and Plants for Gardens and Nurseries will be shown a collection of seeds of vegetables, plants and trees, young trees, seedlings or grafted, etc.

I have attempted to simply give an outline of the classification for both Agriculture and Horticulture, and have not attempted to mention all of the groups nor the classes represented in each group, but simply some of the more important classifications that I believe you are more particularly interested in.

In conclusion, I may say that I am pleased to give you these facts concerning the Departments of Agriculture and Horticulture of what will be the greatest of all Expositions. I have been a resident of the State of Missouri for only three years, during which time I have been Director of the State Fruit Experiment Station at Mountain Grove. However, during a period of about eight years previous, while connected with the State University and Experiment Station of Arkansas, I took a great interest in the fruit growing industry of Missouri, and especially the Ozark region. I believe I am safe in saying that there is no section of the country that promises more in the way of Horticultural development than does Missouri. At the present time Missouri has in its apple orchards the greatest number of trees growing of any State in the Union. The development of the peach industry in South Missouri during the past four years is also wonderful, and I may say that from present indications the real development of the Horticultural industry has just begun.

I do not need to say to you that it is important that the Agricultural and Horticultural products of Missouri be extensively exhibited at the World's Fair. The great diversity of these products in the State, owing to the diversity of soil and climate, offers an opportunity to exhibit the greatest collection of products that has ever been shown.

THE WHAT NEXT OF THE GOOD ROADS PROBLEM.

(By D. Ward King, Maitland, Mo.)

The good roads problem is of national importance; it is receiving national attention. Nothing is too good for Missouri and she will be no laggard in the good roads procession. East and West, North and South, Missouri's methods of earth road construction are being studied. No state in the Union possesses better roads than can be found in this State, while, on the other hand, the earth road within a mile of a Missouri hamlet is not *worse* than the earth road within a mile of Chicago, Cleveland or Washington. At either place, under certain conditions the best of teamsters will "stick in the mud."

Road by Mr. King's farm, kept up by the dragging method. The road that has made a national reputation.

It is my purpose today to consider as briefly as possibly the dragging of the roads; earth roads; the wastes of our present system, and stone roads.

Road Dragging.—The results that follow persistent dragging of the roads after each wet spell cannot be pictured with words. I met Hon.

S. M. Prather, of Tarkio, Missouri, recently in St. Joseph, and as we shook hands he said: "I did not take much stock in your dragging idea at first, but I'll tell you, you cannot talk long enough or hard enough to a man to make him believe what it will do. The only way for him to comprehend it is to build a drag and use it."

Mr. Chas. Hill, who lives about eight miles from Mexico, Mo., writes: "I have tried Mr. King's method of dragging roads and have found it a great success. I have dragged about three miles of road past my place this season. I have seen the time when other roads were cut up into two or three different pairs of ruts, and a man would be forced to travel in one of them. These ruts would come right up to each end of the dragged road which would be perfectly smooth."

In conversation with me, Mr. Hill remarked: "Why, I could send a stranger over the road today, muddy as it is, and he would know within three feet of the place where I began to drag."

I have often told my friends that one could see a wide difference with the eye, but that they must ride over the two roads in a buggy before they could appreciate the dragged road. Now, however, I go further and insist that one must drive a loaded wagon repeatedly over the two before he can correctly estimate the benefit of dragging. I reached the latter conclusion while hauling wheat this fall. One can note at a distance the change in the "chuckle" of a loaded wagon when it rolls onto the dragged road from out of the ruts, but he must *ride* and *drive* if he would get the full effect of the lurching of the wagon and the whipping of the tongue.

Weeds.—Until within eighteen months I did not fully comprehend the importance of low weeds as a factor in destroying roads. I mean low weeds and grass along the wheel tracks. They are an unobtrusive but powerful agent of destruction. There has been an active campaign against the tall weeds and we are compelled to mow them, but the little fellow has been getting in his work unnoticed. It is this way: In the spring the big machine smooths the road from ditch to ditch, then we all drive down the center. After the first shower the weeds spring up and in a few days are ready for business. Their business is a four-in-one combination, i. e., to prevent the rain water from running to the side ditches, thus holding it in the wheel tracks, even when no ruts exist; in dry weather to catch and hold the dust, in wet weather to catch the mud that hoofs and wheels splash; and at all times to keep the surface moist and loose and therefore soft. Is it not clear that if one inch of dust and mud is removed from the center and caught by the weeds on the side, that their relative levels have been changed two inches? When we mow these weeds we aggravate the difficulty by adding their tops to the accumulation. Dragging kills the weeds in the seed leaf and allows the water to find its way unobstructed to the side ditch.

Clay and Gumbo.—When talking with road men in the river bottoms, they invariably bewail the lack of drainage, while the clay hill folks envy the river men because they have no washes. Both classes are quick to say: "If we lived on the black soil of the prairie we would have some faith in dragging, but here ———," and words fail them. Now, the truth of the matter is that either clay or gumbo will make a more substantial road than the soft prairie soil. The self-same characteristics that make clay or gumbo so hard to get into good order, after it once gets exceedingly bad will operate to keep it from getting into bad order after it is once put into exceedingly good order. It will *stay good* just as tenaciously under good methods as it *stays bad* under bad methods. True, it is *sometimes* with exceptionally favorable conditions a good road in spite of poor methods and conversely it is some times with exceptionally unfavorable conditions, a bad road, even under the best methods. By the way, a clay hill, a little over half a mile south of my house is the best piece of road of which I know, taking into account the short time it has been dragged. Before it was dragged, it was noted far and near as a tough proposition. At present, it is good, even in bad weather. Certain gumbo roads, dragged of course, were used last summer and summer before last as training tracks by trotting horse men and as speedways by the gentlemen drivers in the vicinity. Dr. C. N. Scott, of Mound City, says in a letter dated November 22nd, 1902: "* * * * have traveled gumbo road to Bigelow very often in the past five years and never saw it so good as it has been since they began to drag it. I go there to speed my horses. It is as smooth as a race track. I have many times driven over this two miles at a three minute clip," but he never did it before it was dragged. Mr. A. R. McNulty, of Mound City, has known this Bigelow road for thirty years, has been in the livery business for eleven years and has had mail contract for eight years. He usually goes over this road four times a day. Mr. McNulty writes: "The road between Bigelow and Mound City has been in better condition this summer since the dragging began than ever before."

Hon. John Kennish writes: "The (Bigelow) road is a United States star route and is much traveled when fit for travel. It is over gumbo soil and at times is impassible. This fall the road has been worked by the King system of dragging and has been in better condition than it has ever been in the twenty years in which I have traveled it."

Judge M. L. Nauman, of the Holt County Court, in writing of this road, says: "A portion of it has been so wet all summer that we could not make a start, but the other part never was so good before in the history of the road. The dragging is the making of it." It is but just to add that the season there has been wetter than any on the records or within the memory of the oldest inhabitants.

In this connection let me ask you did you ever see a wagon road through a swamp or over a gumbo slough which was dusty while at the same time there was plenty of water and soft mud within a few steps of the dusty wheel track? Did you ever drive over such a road and watch the path rise and fall under the horses' feet and see the mud and rushes shake for ten feet around? Did you ever see in such a road "chuck holes" that were from eight to eighteen inches deep with *dust in the bottom?* Dust in the chuck holes and water standing close by several inches above the average level of the ruts? Many times have I seen such conditions and it always seemed to me that I was driving over a raft or traveling along the length of a great narrow boat. Did it ever occur to you that a material that will make itself, *make itself,* mind you, into a huge boat over which one can drive below the *level* of the surrounding mud and water—did it ever occur to you? I say that this same material would make a splendid road if we could just turn it upside down, turn the boat bottom-side-up, as it were, and then take care of the bottom, watching it closely to prevent holes or hollows forming in which water might lodge?

Col. Clay, of Mexico, Missouri, tells me of a locality in the State of Mississippi where roofs of lumber are built over certain roads. Oil is used in some places to assist in making a water tight surface for the road. Asphalt would be without value if it leaked. John Loudon McAdam insisted on a firm, dry foundation to be covered with small stone so rolled and packed that travel would cement the surface and make it impervious to water. McAdam said: "The thickness of (the stone on) a road should only be regulated by the quantity of material necessary to form such impervious covering." The highest type of macadamized turnpike therefore is a solid roof made of small stone. We have seen gumbo roads that during a wet season reminded us of the boundary line between the United States and Canada, because it was a chain of great lakes, and these miniature lakes are there because those dusty chuck holes hold water like so many big tubs. Gentlemen, it is more difficult to build a boat or a tub than it is to build a roof. Hear me! If gumbo will manufacture boats and tubs without the use of brains, surely men with brains should be able to manufacture a roof from the same material. Let us roof our roads with clay or gumbo by careful, regular dragging. A thoughtful, conscientious trial will convince the most incredulous.

Waste.—Few of us appreciate the wastefulness of our present system. It is wasteful in the extreme to work the road with a big machine and leave it untouched for two or three years thereafter. Especially is this true if the machine is used for the purpose of moving a mass of loose earth, weeds, trash, etc., into the center of the highway. Most of us realize this fact. Most of us also see the waste of time and money caused by breaking in one new team each day and by having two or three men idle while their teams are at work on the machine. But have we ever made a careful estimate of these wastes one by one and then footed them up? Let us do some ciphering. We will first consider the "green team" item. Many of us have seen new teams put on the machine in the morning that so disorganized the other six horses that the outfit did not get to working steadily until the middle of the afternoon. And we have seen balky teams and balky drivers that not only made the other animals do all the work but drag them along to boot. We are also acquainted with the lazy team driven by the shirk; their double trees are back against the wheel, they do no work, neither do they allow the team on the other side of the tongue to pull. Indeed the very best new team cannot, for reasons obvious to every experienced teamster, do itself justice when it first sets in. May we not, then, conservatively estimate that the average "green team" does only half a team's work up to noon of the first day? That is to say, one-fourth of one day's work for a two horse team is wasted by that team. But the other six horses have also lost time. We will estimate the loss of each of the other teams as being one-half the loss of the green span; that is, one-half of three-fourths, or three-eighths of a day, which added to the other one-fourth gives us a total of seven-eighths of a day for one team. If a team is worth one dollar per day, we have a loss of 87½ cents. Conservative road men will, I feel sure, agree that this is a low estimate to put on the difference between a strong able team of eight horses accustomed to each other and to the work and, on the other hand, a picked-up team, no span of which works longer than a day and a half and which is being constantly changed and disorganized.

Eighty-seven cents waste per day for breaking green teams. The men who drive and operate the machine waste time also by reason of the green team. Computing their loss on the same basis as before, each man will lose one-eighth day, equal to one-fourth day for one man, or twenty-five cents, making our total, so far $1.12½. To this we must add the time of three other men, for one man can drive eight horses, four abreast almost as easily as he can drive four horses, two abreast, so here is another item of loss amounting to $3.00 per day for extra men, giving us a grand total loss for teams and men of $4.12½ per day. More than this is spent on each mile of the road in a majority of our counties and twice as much in some of them. All this is on the presumption that the machine is doing *heavy work*. That is, cutting down banks, filling big ditches or making brand new roads. If, however, it is being used with only four horses and merely for the purpose of smoothing the surface, then there is a still greater proportionate waste because the same work can be done with a well made drag. Listen, the empty machinery makes a load for a team, too much of a load for the average farm team. Those of you who have moved a big machine five or six miles will support me in this statement. Listen again, if one team is necessary to move the empty machinery, then when we hitch to it with four horses, *only two* of those horses are moving dirt. We are then, in this case, wasting at three points, namely, first, a team hauling heavy machine; second, a man operating machine; third, by using an expensive implement when a cheap one would answer the purpose. An expenditure of $4 and wear and tear on a (say) $200 implement to accomplish a result that can be reached by an expense of $2 and the use of a (at outside) $5 implement. Moreover, the drag will do the best job unless the big machine goes over the ground twice, because the knife of the machine is adjusted by the wheels and each time a wheel goes over a bump or drops into a rut, the knife is raised or lowered. In order to do a smooth job, one must go a second time. On the other hand, the drag gets two whacks at the bumps and has two chances to fill the ruts and sticks close to the surface of the ground at all times.

View of Rock Road, Strattman, St. Louis county. Rough surface caused by recent water-main construction. By courtesy of A. A. DesChamps.

Rock Roads.—I am persuaded that many localities in Missouri are enduring worries, expenses, and other disadvantages that adhere to mud roads because they honestly believe that they are not able to better themselves. The conviction that progress is possible must first exist before any attempt at progress will be made. It certainly is unfortunate that the mistaken idea that macadamized roads are impossible prevails in so many communities. Some folks seem to have a notion that unless the fields are covered with stone, rock is too scarce for road building. I will be dogmatic for a moment and assert, as a general proposition that a macadamized pike is a possibility wherever land is worth $30 per acre and rock can be obtained within two and one-half miles of the proposed road. Not all the roads, of course, nor perhaps even half the mileage, but the main thoroughfares.

Permit me a few moments in support of my position. While visiting in Alabama last summer I saw rock roads building at a cost of $2,200 per mile where the best land was priced at only $25 to $30 per acre. Moreover, in my opinion, the road they were building was far heavier and wider than the travel demanded, and therefore much more expense than necessary. But the people there have been educated to see the advantages of the stone road. Please do not think I am speaking of a radically progressive community. The old darkey still doffs his tattered hat and steps off the sidewalk as you pass. Chain harness is the rule. The old style bull-tongue plow is in the majority and these fine roads are traveled by ox teams. Not of the "New South" am I speaking, but of the genuine old fashioned, hospitable old South of the ante-bellum days. And now another statement: Although rock is superabundant thereabout, still the contractor found it profitable to haul the crushed rock two and one-half miles before moving the crushing machinery. I submit, gentlemen, that these two facts prove that with rock less than two and one-half miles distant and land at thirty dollars per acre, macadamized roads are a possibility. And it would seem a natural sequence that where land is more valuable, the stone can be hauled farther.

And now let us consider an instance where a community might have rock roads if they just thought so. I have in mind two towns here in Missouri, lying about six miles apart. What is land worth? Well, land between these two towns has sold recently for $80 per acre. Probably not an acre could be bought for less than $50; therefore, the land value is there. As for rock, if we start from one town to go to the other, we find rock within a hundred steps of the highway before we travel a mile. At two and a half miles, rock is less than one-half mile distant. At three and a half miles, only three-fourth miles away. At four and one-fourth miles from town but one-fourth mile to rock, while at five and one-half miles it is only one-half mile from the road to a quarry that is kept open constantly. Here is rock, quantities of it. Here is land worth much more than thirty dollars. Why don't these people have a stone road? *Your* answer? Is your answer ready? My answer has been given; the answer is found in the conviction of the people that rock roads are beyond their reach. The people have been educated to this belief by reading the wails that rise from our brethren in the rockless regions of our neighbor states. And all that is needed, gentlemen, to inaugurate an era of stone road construction right here in Missouri is the removal of this mistaken conviction.

In conclusion: I pin my faith in the future betterment of our highways to these foundation truths:

1 Rock within two and one-half miles is available where land is worth $30.

2. Six or seven feet of stone is sufficient for the average rural traffic.

3. Any community where rock is available is behind the times if it does not each year build a mile or more of stone road.

4. Where stone roads are absolutely out of the question and where, if they can be built, they are not yet an accomplished improvement, a dragged road is the best substitute.

If we hammer away at these four propositions, the desired results will in due time be obtained.

THE A B C OF ROAD DRAGGING.

(By D. Ward King, Maitland, Missouri.)

The most difficult part of road dragging is getting at it. All the rest is so simple that one learns it in the doing. The first noticeable effect is the smoothing of the road surface, and this in turn allows the rain and snow water to flow off, and encourages the distribution of travel over the road from side to side.

Teams usually follow the beaten trail. Dragging destroys the old trail and the new trail, each time border and less definite than before, is made on a different portion of the highway. By dragging while the earth is yet moist the road finally becomes a series of practically waterproof layers of puddled earth, each one of which is rolled and pounded by the wheels and hoofs of travel. Almost imperceptibly the center of the road is elevated until you discover that you have made a smooth grade that is not easily effected by bad weather.

Dragging kills the weeds in the seed leaf. It also does away with the bumps at each side of the bridges and culverts. Regular dragging fills them and they become as solid as the rest of the road. As the wheel tracks are all wiped out the water does not run to the bridge after every little shower as it used to do, so you can drive as swiftly over the culverts as over any other portion of the dragged road.

A peculiarity about road dragging is that you do not comprehend the steady improvement until after your neighbor begins. When he begins, then you will see how much you have gained. Of course you knew it was better than the common road, but you did not know it was so much better this year than it was last. But if your neighbor is a year behind you the extra year's dragging your road has had will be apparent at every wet spell. Your road is a year drier, a year harder and a year thicker than his. His road will cut up quicker and deeper and will not dry near so soon as yours.

At first you will have to drag when part of the road is too wet,. But after a while it will dry evenly, and the first few times you drag it will be better for you to merly drive down one wheel track and back the other moving the dirt toward the center of the wagon track. Gradually widen as you get a chance. This will give a solid foundation. If the wagon track is at one side from the highway begin right there anyhow. The rest will follow in time. Don't be in a hurry. Make haste slowly. Remember you cannot successfully give a house three coats of paint in twenty-four hours; nor can you make a fine crop by plowing the corn four times in one day. First, make a drag, second, use it every time you can improve the road by dragging. Practice will make both you and the road perfect, —almost.

HOW TO MAKE AND USE THE DRAG.

For the purpose of giving more information about how to make and use the road drag, we print the following extracts from the pages of the 34th Annual Report.

"The drag is made by splitting a log, placing the two pieces about thirty inches apart (with the flat sides both facing in the same direction,) and pinning them together. The lower edge of the front piece is protected by iron; an old wagon tire will do. The log should be ten or twelve inches thick and about ten feet long. Fasten a chain or heavy wire a foot or eighteen inches from each end by which to haul it. Hitch the team so that the drag will move the dirt toward the center of the road. The hitch is next in importance to the time at which the dragging is done. The right time is just as the road dries after a rain or when it is thawed on top during the winter or spring, and it should be dragged *every* time.

"Of course a smooth surface for travel is thus produced, but a more valuable result is that the road will shed the *next* rain instead of absorbing it. This is the reason why the road should be dragged every time, so that it always will be ready for the *next* rain. If I do not say anything else here today that is remembered—and if the people in this Association do not get any other thought that they can carry home with them, I want them to get that idea—the way to make a good dirt road is to keep it so that the next rain will not go into it. This means dragging only about once a month on an average. I have kept track of it in order that I might be able to speak with authority as to the amount of time and I find that the average is twelve times a year, that is only once a month; not much to secure a good road. I drag from my own front gate to my neighbor's front gate, a half mile. It takes about twenty minutes. I don't make very many trips to town before I have regained the time I expended in dragging, to say nothing of the gain to my neighbors and to the general public.

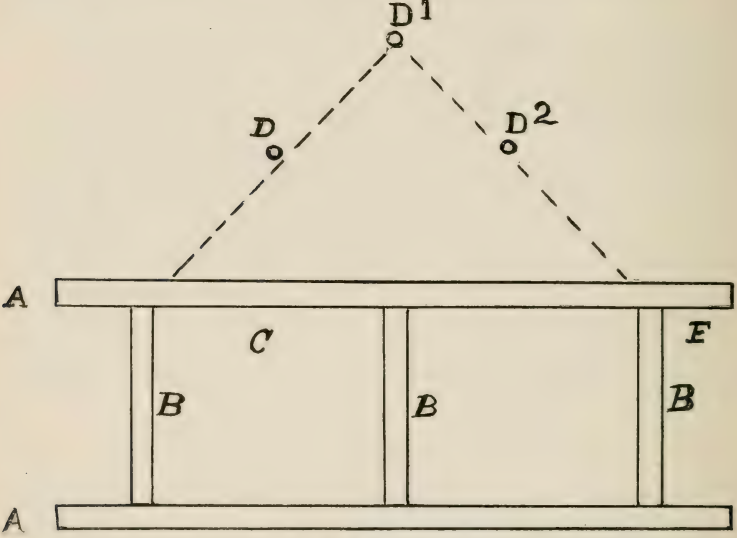


Diagram of King's Drag.

A, split log, 8 to 10 feet long, 10 to 12 inches thick, set on edge, both flat sides to the front.

B, strong oak, hedge or hickory bars, the ends of which are wedged in two-inch auger holes bored through the logs or slabs.

Dotted line, chain or strong wire.

D, D1, D2, rings to connect double-tree clevis. Hitch at D1 and stand at C, on a plank laid on the cross-bars, for ordinary work; or hitch at D2 and stand at E for ditch cleaning or to make the drag throw more dirt to the left. To move dirt to the right reverse position of driver and last hitch. If working a clay road, put iron, old cart tire, or something of the sort, on lower edge of drag at the end of six months; for softer soil at the end of twelve months.

"This method is very simple, as I have said, but to one who is familiar with the ordinary dirt road under all conditions of season and weather, the results are but little short of marvelous. Teams pass here at a sweeping trot when other roads are almost impassable. When the other roads are in such a condition that loaded teams must be rested every few rods, the same loads are moved over this road at a free walk and without resting.

"More dirt can be moved and more of a show can be made by dragging the road during thaws in winter weather than at any other season. At such time the soil is crumbly and mealy and pushes to the center very easily. If a road is dragged two or three times in March or April it will show the effects all summer. That statement seems rather improbable and yet it is true that where I have succeeded in getting a neighbor out in April, May, or even March to go over his road just once or twice, that all through the summer you could tell it had been dragged. The weeds do not grow up on the edge of the road with a slant toward the inside as they do on a road that has not been touched after winter travel. But if one wants a road such as I have tried to tell you about he must live up to the motto, 'keep your road ready for the next rain,' and to secure full satisfaction he must carry out the idea for several years. However, do not allow this to discourage anyone—but make a start.

"Nor is an iron faced implement absolutely necessary. I began with a drag made with an old post and a frost-bitten pump stock held together by two or three short pieces of inch board nailed on top. It pulled to pieces at the beginning of the second year. And at first I simply drove a team straddle of one wheel track, going, and of the other wheel track coming back, merely breaking the rim of earth that rises on each side of the wheel track and leaving the road in good condition for teamsters to "straddle the rut." After smashing both ruts I remember I used to look down the road approvingly, pat myself on the back and think I had the nicest road in the country; and while I did at that time, yet it would look very rought to me at present. These days if my road does not look as smooth as a quarter stretch I expect people to criticize it. I hope you will not think I am exaggerating. Mr. Waters was there and saw it and he will bear me out when I say the road in front of my house and for a half mile south to my neighbor's is in as good condition as any quarter stretch at your fair grounds and it is that way most of the time—of course not while it rains—it is not that way until the mud dries up, but just as soon as it dries, and it dries a day or two before the other road, I get out over it with a drag just once and have another quarter stretch. If I don't get over it the neighbors are after me to know why I don't. This shows the power in such a condition of education. The people are accustomed to finding that road so that they can drive over it as fast as they wish and if they cannot do so they want to know 'what's the matter with King.'"

THE BEST APPLICATION OF OUR ROAD LAWS.

(By Col. G. W. Waters, Canton, Mo.)

I want to say a word or two about this dragging of the roads about which Mr. King has spoken. The county which has perhaps the greatest mileage of dragging on its roads is Caldwell. I was in the shops where they made these drags and there were over fifty in use in Caldwell County and the results stated by Mr. King are fully verified there. They have been using this method for over seven years. In Daviess County, Jas. Tuggle, near Gallatin and William Wood in Ralls County have been using this method for a number of years and what Mr. King has said is fully verified. I believe he said one thing which ought to be fully emphasized, "you will not believe the full force of the value of this method of keeping up the road until you have seen and tried it." I do not want to detract one iota from the argument Mr. King has made, but if no other thought was emphasized than this, the value of the continuous care of the roads in this way, it would certainly be of inestimable value. Having seen this method of work, I was thoroughly impressed with it, and after I had stood upon Mr. King's road and had seen that he had worked it out to a finish better than any other one single place I had seen, I uttered there, upon that ground, the statement that "if all the supervisors and road overseers in the State of Missouri could stand there and look over that road which was in full view and appreciate the value of Mr. King's method and be impressed with it, that it would be worth to the State of Missouri one hundred thousand dollars a year in the maintenance of their public highways." I said it then and I have no reason to doubt the truthfulness of that statement now.

The topic that has been assigned me is the "Application of our road laws to the road maintenance." It occurs to me this way, gentlemen, that we ought to inquire into our laws and see if we have laws that are anyways near suitable for the purposes for which they were framed. If we have, then we ought to proceed under the laws, because so long as we are dissatisfied with our laws we will not make progress under them. So long as we are looking out in some direction for something that will make us better roads than what we have, we will not go to work under our present conditions. You take the farmer who feels way down in his heart that he is living where conditions are not favorable and wants to get away from there to a better country, that man is a dissatisfied man, there is unrest in his soul and he will not be a progressive farmer; but if he is reconciled to his place and believes in the possibility of his farm, he will proceed to improve his farm, improve the conditions around him and take heart.

Now this Road Association, of which I happen to be Secretary, has been in existence about twelve years and the first work that we had in mind and in hand appertained very largely to the modification, amendment and improvement of our road law. There was a widespread sentiment over the State that the laws of our State upon the statute books were absolutely inadequate and that if we could get the laws amended, we would have good roads. We worked in that direction and labored in it and had conventions. We had State conventions in all the principal towns of the State of Missouri outside of St. Louis and Kansas City—conventions at Sedalia, Columbia, Chillicothe, Cameron and all over the State. We eventually secured such laws, in the main, as this Association wanted. We were not able to secure just the laws we wanted, but we have gotten the laws practically as we asked for them.

And then the people of the State began to see something—they began to see that the laws of the State and the constitutional amendments that we had clamored for, that these things did not make us roads. There seemed to be a sentiment that had gotten abroad in the minds of the people that if we just had the right sort of laws we would have good roads; but laws and constitutional amendments do not make roads. Now we have gotten to a point where there is a re-awakening; there was first an awakening in the direction of the improvement of our laws, but we have arrived at the point where there is something of a renaissance, something of a revival got into the people in 1900 and there is now a re-awakening which is widespread all over the State and the people are casting about in their minds and making inquiry about how to proceed about the improvement of our roads and highways.

Now I want to speak about the law just a little while. A law is something that should be, if it is a good law, crystallized sentiment, the result of experience, and the law if it is any account at all, must conform to business principles and to the conditions demanded, as based upon the experiences of men in business circles. The law does not make the institution, the law is such as to conform to the business principles in the thing. Now we will make an inquiry first as to what business principles are in a road system and then let us see, having discovered the principles of a road system, whether we have laws that conform to these principles. Now we will look at it in that way just for a few minutes. A road system—all road systems must be co-operative systems, that is absolutely necessary. My friend, Mr. Canaday, might have the very best conception of how a road should be constructed and maintained; he might have the very best conception that could be thought out by the human intellect but he could not make use of it until his neighbors and all the people in his district would co-operate with him to inaugurate these conceptions. It is necessary that they should be united, hence a road system is a co-operative institution. Being co-operative, it is a corporation. Every road district is a corporation in so far as business is concerned and also so far as law is concerned. Being a corporation, the people in the district being the stockholders, the roads their property and the maintenance of the roads their charge, then we turn and make the inquiry what business principles govern corporations? Now is not this right? If you will agree with me there, then you certainly will agree with me as we proceed. Corporations, bank corporations, mercantile corporations, all the railroad and school corporations—because the school is a corporation—all of them transact their business through the boards of directors. Don't they? Therefore, we conceived the idea that a road system and the laws governing a road system should conform to that idea and that there should be for the management of the business of the road corporation, of the road system, of the road district, a board of road commissioners or a board of road directors. Now we have them. This law is called the "commissioner law." Now the other system, the road district law where each road overseer is appointed by the county court or elected, that system is in direct violation to the business principles that enter into the management of corporations. It does not conform, and hence that has been one of the things that has been a drawback, a bar to progress in the road management in the State of Missouri.

Now let us go into an analysis of the road system. The road system is necessarily a complex one, it embraces distinct features. There is first the feature of the road system which is for the raising of revenue, and under the laws of our State and under the proper management of things, the raising of the revenue is taken care of by an official board entirely distinct and in no way connected with any of the other affairs of the road. In our State the County court or the township board in a township organization are the ones that take care of this feature of the road question.

There is another division. We have the revenue to be collected by those elected or appointed by the county court or by a board of township officers. The other feature is the management of the business of the road district. We call that supervision. The supervision has nothing to do with the feature of revenue raising and it should not have anything to do with it; and we have a third feature which is separate from the other two, which is the feature of road building or road maintenance.

Let us make a comparison here between the school and the road system, the parallel is quite close. We have first the raising of the revenue, which must be attended to by the county court, which makes out the tax bills and collects the money and places it to the credit of the district. The

Board of School Directors, then, have the management of the business of the district; the building of the school houses and securing of the teachers, etc., but when it comes to the third feature, the work of teaching, another person entirely, is at the head of that. Don't you see? The teacher has to be a man or woman qualified for that especial work. The Board of Directors may not be competent to teach school, it is not necessary that they should be; they may not be competent to manage the assessment and collection of the taxes, it is not necessary that they should be; the distinctive feature of their work is the management of the business of the district. So likewise the Board of road commissioners manages the business of the road district. As the Board of Directors of a school district employs the teacher and, indicates in a general way what sort of work he shall do, decides upon the length of the term, etc., so, in like manner the Board of Road Commissioners employs the persons who do the actual work on the roads, by contract or in any other way that seems best to them.

This is the central thought, the spirit of the law that we have upon our statute books today, called the road commissioner law; it conforms to business principles. You may look, gentlemen—I speak now advisedly—you may ransack the laws upon the statute books of every state in the Union, you may look [illegible] the business principles in these laws and look as you may you will not have a better set of principles than those I have announced in any of them. As evidence of the truth of this, when this law was enacted in 1899 there was a howl of disapproval went all over the State, such a howl of disapproval as perhaps was never heard upon the enactment of any other law. In one county—I am going to give you a specific case—the antagonism to that road law was so severe that the member of the legislature, who had been in the legislature of 1899 was thoroughly convinced that he would be defeated, and they relegated him to the rear and a man by the name of Blank, a brainy man and an elegant gentleman was elected. He was elected upon the proposition that he was unalterably opposed to the road commissioner law. I knew him and have known him all his life. He was a thoughtful and conscientious man but had not studied this law very much. He used it, of course, for campaign purposes, as you know a politician will do. After his election I sent him some very carefully selected road literature, giving some arguments used in 1898 and used with the General Assembly in 1899 to get that law upon the statute books. I sent him these and asked him as a friend to read them and sent him a copy of the law—for he had not read it—and asked him to make an investigation and I said "You cannot afford not to do it. All I ask of you is to make a careful investigation, and don't stop at mere surface reading, but go down into the question." He did so and

I told him I wanted him to meet me at the State meeting at Fayette. Mr. Blank is a conscientious man and he went to St. Louis and spent at the public library in that city, a whole week studying the road laws of the different states of the Union. He came from St. Louis directly to Fayette. and said to Mr. Reed, the president of the Improved Roads Association: "I have investigated this law, gentlemen, and I must confess I find no fault in it. I mean to say, no fault in the general principles of it." Now what was he to do? He was, to use a very uncouth expression, between the Devil and the deep sea. His constituency were behind him looking to him to wipe out of existence and forever obliterate every sentiment in favor of this law and if possible expugn it. There was his constituency on the one side opposed to it and his conscience in favor of it. But he acted honorably, he got up before this Association and before the people and said: "Gentlemen, I have investigated this question as thoroughly as I can, up-to-date, and I am prepared to say that there is nothing wrong in the principles underlying it."

Let us look again and discover some of the things wherein this commissioner system is distinguished from the road overseer system. Take the question that was very carefully discussed by Mr. King a moment ago, that of the wasting of the revenues. Why a waste? I do not know that he explained just why. We have two classes of revenues, a cash revenue and a labor revenue, and if there is any one thing that we have been striving harder to do than any other, it has been to forever wipe out of existence the barbarous system of paying poll tax in labor. We made an investigation of that question and wrote to every county in the State of Missouri some years ago—that was in 1898—and asked the men who had knowledge of road matters to estimate the value of poll tax paid in labor as applied upon the roads, and as a rule they put it below fifty cents on the dollar, some, in fact, as low as twenty-five cents. Striking a general average, it fell below forty cents on the dollar. Mr. King has told us why the labor for poll tax is of so little value and we need not argue this question any further. We have sought all these years to establish a law that would require that all the road tax, both poll and property, be paid in money. This principle of paying poll tax in money goes further than Mr. King outlined. He went far enough to show the utter wastefulness of it, but it goes further. By the use of this kind of revenue it is impossible to adopt some other principles that ought to be adopted. It is in the way, a barrier, a bar which you cannot get over. Why? In trying to adopt the contract system, a large percentage of the revenue would be payable in poll tax labor, consequently the adoption of that method becomes impossible. It is also almost an absolute bar to another proposition, that a continuous application upon the road the year round is needed all the time. Suppose we are dependent upon poll tax paid in labor; the sentiment of the district is with the commissioner and he says we ought to get out and do the grading in the early summer or spring time: if we are dependent upon poll tax paid in labor, the farmer, being a very busy man at that period of the year, cannot possibly do it; and consequently it has become a habit so long in vogue and so long in use that it has become almost second nature with us that we give our roads a periodic working once a year, and as Mr. King has very forcibly expressed it, it is like undertaking to raise a crop of corn and doing all the cultivating in one day. Is not that right? Whenever you have to depend upon labor paid tax you cannot do otherwise. These are two important principles that cannot be put into use when we depend on that character of revenue, consequently it makes an estoppel right there and we cannot make progress so long as we use that character of revenue. And these things being as bad as they are, the fact of the inefficiency of the teams and all that being as bad as they are, that is not the worst.

There is another thing to it yet. There is another estoppel, an absolute bar to progress and that is this, so long as labor paid revenue is the standard the money put in with it is depreciated and brought to the level of the labor standard, it is not worth exceeding forty cents on the dollar. We were in a position to appreciate the force of this when we were promulgating the bill, expounding it and endeavoring to get an increased revenue; endeavoring to get the people of Missouri to vote an increased amount that may be applied upon the roads in the several counties. A few years ago, in '95 or '94 probably, when that proposition was submitted to the people of Missouri, they said "No!" and said it with emphasis. They said "The money that we are now paying for road purposes is squandered, and we will not permit their getting the use of any more money to be squandered." Why was it squandered? Because it was used in connection with the labor standard and so was worth 35 to 40 cents on the dollar. In 1900 when it was shown to the people that there was a possibility that the additional amount of money would be used so that every dollar expended would produce one hundred cents worth of value; after importuning them, after making road speeches in many parts of the State and going to conventions and institute work and writing papers and urging the farmer to vote for it, he did vote for it and by an overwhelming majority the constitutional amendment was adopted, allowing a levy of fifteen cents additional revenue on the hundred dollars for road and bridge purposes. And I want to say to you that so long as you retain in your road management, this principle of using poll tax in labor and making labor the standard—so long as you do that, progress is absolutely impossible. If you want to make progress in your county, if you want to make progress in your township, if you want to make progress in your district, go back and say to the court and the Boards of supervisors in your township: "Exercise your prerogative which the constitutional amendment gives you."—and also "Exercise your prerogative which the law gives you, which was amended in 1901"—and not till 1901 did we get that far along. But, we did, after importuning the committee, get them to put in a clause providing that the county courts in the several counties may require that all the poll tax shall be paid in cash, and that is the law today; but it has to be by the action of the county court. Now this is the plan under the present road law and I speak for the counties not under township organization.

When we were endeavoring to unify the road laws we called the representatives of the sixteen counties in the State under township organization together in the halls of the Legislative Committee room and the value of the commissioner system was laid before them and we showed them as best we could its principles, in which they agreed with us. Mr. Ellis was one of these members and there was a bill drawn by Mr. Ellis harmonizing the township organization road law and the general road law of the State, which was accepted, so far as I know by every member from the township organization counties and it was passed and became a law of the State, but for some reason unknown to myself it was repealed in 1901.

THE GENERAL INTEREST OF THE UNITED STATES GOVERNMENT IN THE IMPROVEMENT OF THE PUBLIC ROADS.

(By Hon. W. R. Richardson, Commissioner of Highways, St. Louis, Mo.)

It is quite a pleasure to me to come to you on this occasion and tell you something of the interest of the Federal Government on the subject of Public Road Improvement. The story, I am very sure, will be of encouragement to those who are interested in this very necessary public improvement. Even with all the work that has been done, all the agitation, all the earnest effort on behalf of a great many of our people who have given so largely of their time in advancing the questions of bettering the roads, we are still as a nation behind all the other countries of the world —not only the civilized countries, but many of the semi-civilized countries —in the condition of our roads, and really there is no other question that is of such importance, such necessary interest and usefulness to everybody, as a thorough control of the road by the Government. The subject ramifies nearly everything with which you have to do. It is nearest to you from a social standpoint, from an economical standpoint and from a financial standpoint, from the standpoint of comfort, of pleasure, of business. It interests your stock, your advancement, your everything, and why it is that the American people, so enterprising in every other respect, should give such a left-handed, secondary, almost indifferent consideration of the question of improving their highways, is one that has not yet been solved. We demand the very best in everything else. We want good level grades on railroads; we want heavy rails; we want splendid road beds; we want good substantial bridges; we want every comfort in the way of cars and every accommodation, we want rapid transit; we demand every facility of this kind. When we travel by water unless we have some palatial boat we cruelly complain, say it is unbearable, unendurable unless we have every convenience of this kind, and at the same time we will endure for ourselves, our families—our wives and our children and all who are nearest and dearest to us—the beast of burden that serves us, the most ridiculously uncomfortable, miserable, conditions of the common roads, dragging through the mud, over rocks, down through gulleys and gutters, and every other condition, and go on doing it day in and day out. We suffer in our schools, we suffer in business, and we suffer every way from this condition and at the same time we do not give it that business application and determination to improve it that has made the people of the United States far ahead of nearly every other people on the face of the earth, in the advancement of industrial, commercial and social conditions.

The New York Chamber of Commerce several years ago after a siege of what is known as the "mud blockade," by which their commercial interests were so hampered and interfered with that it disturbed those men and stopped them from watching the click of the Stock Exchange and their business affairs, to inquire what the trouble was and when they learned that it was the condition of the roads, they stopped to consider for amoment and then proceeded to vote the sum of $10,000 and presented it to the Government with the request that a Bureau or Division be established by the United States Government for the purpose of inquiry into the condition of the public roads of the country, and to suggest along lines that might lead to their improvement. You know there always has been a very strong sentiment or jealous idea prevalent that the question of State rights when applied to the improvement of roads, was something very sacred, and that the Federal Government was encroaching upon a time honored principle of this Government whenever it took any interest in affairs pertaining to the improvement of the common roads. We can touch it from any other direction. We may spend a vast amount of money to improve rivers and harbors, although they are on the borders of the several states, but whenever we touch that which comes next to the home and next to the man in the matter of home affairs, whenever we touch upon the question of roads, we immediately hear that the Government is going beyond its function and entering the domain of state rights and state affairs. I am glad to say, gentlemen, that we are gradually but slowly and surely breaking away from that distinction as applied to the road question. This amount voted by the Chamber of Commerce in New York was accepted by the Government, and this department is doing a great work. The amount of work that that department is doing to promote Agriculture throughout the United States is almost immeasurable. They established in that department a little division called the Office of Public Road Inquiries. Sometimes we wonder why it is that such a large name was given to such a small office; it was done with the idea to restrict the office to the work of inquiry and not for road construction, having to encounter the prejudices which existed at that time. This was in 1893. Gradually from year to year smaller sums of money were appropriated for this purpose, and this office was maintained only issuing bulletins from time to time and spreading information where it could be done. In the fall of 1900 a National Convention upon the subject of "Road Improvement" was held in the city of Chicago, and from that convention was organized the National Good Roads Association with its headquarters in that city. They invited all of the states to do something that would arouse the people and attract their attention to the importance of improvement of the highways. With that end in view, different plans and schemes were devised. The idea was suggested that there might be some great railway system that would be willing to furnish a train, that the manufacturers might equip that train with the necessary road machinery, that the Government would lend its influence and that this train would traverse the system of this railway and construct object lesson roads, that they might hold conventions, that they might co-operate with the local, State and Government officers, railroad officials, road machinery people, the press, which is the great educator of the Union, and through them, stir up and arouse and stimulate an interest upon this subject. The first great train started from Chicago and held its meeting in the latter part of April, 1901, in New York. That campaign lasted for three months over that great railroad in the states of Louisiana, Mississippi, Tennessee, Kentucky and the lower portions of Illinois. Following this, there was a meeting at the Lake Shore at the Buffalo Exposition. And then in October came a train that was operated over the great Southern Railway that went through the states of Virginia, the two Carolinas, Alabama, Tennessee, portions of Kentucky and Georgia and down through that country. This itinerary consumed about five months' time, visiting all the principal points in those states, holding conventions, constructing object lesson roads, etc. The result of all that was that the last Congress, the session before this, increased the appropriation for the office of Public Road Inquiries from $10,000 which it had been appropriating to $30,000. This enabled the department to commence a campaign in the Northwest. The National Association then gave way, and the Government took up the work. We laid the matter before Hon. James J. Hill at St. Paul, and he put at the disposal of this convention two splendidly equipped dining, sleeping and box cars for the accommodation of the crew of officers and engineers. This train made a tour through Minnesota, and the Dakotas, and then the tour was extended down through Washington and Oregon and through Salt Lake City and Denver. The result of this expedition has been wonderful, keeping the interest wide-spread; the people everywhere have had their attention directed to the importance of the subject, and now as a result of all that has been done in these several states; as the result of all this campaigning; as a result of this work; not only this but all that which led out from it, the people are devising means of practical legislation at the meetings of these general assemblies. They are organizing associations purchasing necessary machinery, developing their different kinds of materials for road making purposes and there is a general interest in the work of road improvements throughout all the States of the Union. Not only is that the case, but in this session of Congress, Representative Brownlow of Tennessee, has introduced a bill which enlarges the Road Division under the Department of Agriculture with an appropriation of $20,000,000 to this division to enable the National Government to give the necessary aid for the construction of roads in the United States, covering that provision of the Constitution which says that they have the right to construct and maintain military and post roads. You would be surprised at the interest that is manifested in every direction, and particularly in the East and South and the Northwest upon the subject of this bill. Thousands and thousands of letters are pouring in from every direction, resolutions adopted by the different associations, organizations and road societies of the several states, urging upon the members of Congress and others the importance of enacting the principles of that bill. I hope before I sit down to explain to you in a measure some of the features of that bill, and if it is possible, I would like to have you endorse the principles of this bill, and that your interest might go in the direction of endorsing the principles if not all of the detail features. All the states which are making substantial progress in permanent road building now are those which are operating under what is known as the Modern State Aid Plan. It is an exploded idea that the roads and common highways must be constructed solely by the farmers or by those owning land, and that the cost should be laid upon the abutting property. The towns, the cities, the people in general, have just as much interest in every way in good substantial roads as the farmer, and it is an unnecessary burden, a wrongful burden upon the land and upon the farmer, to require that he shall be made to stand all the expense of the construction of the roads. Now we all recognize that for many years to come, a large percentage of the roads will be the common earth roads and we cannot hope in a day to surface these roads but I want to say to you gentlemen that you will never have a good substantial road, such a road as your interest demands, until you surface that road with some hard, resisting material. Now you must come to that proposition. You may improve the earth roads, and you may get good, satisfactory results from them; you may improve your natural conditions a great deal, and that is to be commended; but what you want to do is to put your heads together and evolve a system that means for you and your county and your district, good highways that are surfaced either with substantial rock or gravel or mining slag, or something that makes a good durable road. This is not an impossibility, it is not a burden when its cost is properly equalized. In the States of New York, Massachusetts and New Jersey, they are building splendid roads—probably more expensive than it would be necessary in these Western States. Those States are rich and the people have gone into it and they are building expensive roads. You need not follow all of the details of their laws, but those principles should be adopted, and they will be and must be before you have a satisfactory system of road improvement.

Now, Col. Waters said this morning that your present laws upon the statute books were all sufficient for your purposes. I have read over the statute laws of the State touching upon the question of roads, highways, bridges, etc., and in a general way I can endorse what Col. Waters says. My impression from reading them, however, was that upon the subject of highway improvement you have overlooked a very important principle in the enactment of these laws. Col. Waters said this morning that the laws were perfect but we did not have good roads and the law would not build roads. That is very true. Now, in order to have roads and to construct roads, you must have your laws practical and applicable to conditions, and some force must be behind them to put them into operation. Now, if I am not mistaken, the law in regard to the construction of hard roads in this State provides that a petition must be signed by the adjoining land owners along where the road is made, and that the tax levy must be restricted to the district wherein the road is to be built. Now, with that principle it will be the exception if you ever build many hard roads, because a man is not going to sign a petition to build an expensive road that is practically going to confiscate his property, and he is not going to do that for the general public and incidentally for the benefit he may get from it. He may use it a little more, but that is the only difference between his use and that of the general public. Now, no man is going to sign that kind of a petition, and it is not just that he should. The principle in the construction of the hard roads is that it should be under a general supervision either by the State or through the county, and the states that are most successful are the states that are organized under a State supervision, and the tax for the construction of these roads is paid in a sum one-half or one-third by the State, 25 per cent to 30 per cent by the county, and about 15 per cent by the abutters of property. That equalizes the cost. They are letting them out upon contract and the result is that petitions are now piling up in the office of the engineering department and highway commission of these several states to such an extent that it will take them years and years to build all the roads that are applied for, and every legislature brings numerous requests from the state to aid in the construction of these roads and highways. The farmers and those who opposed this sort of measure in the beginning, are now the most hearty in its endorsement, the most clamorous for the roads, and they are building throughout these states magnificent highways. And this is the solution of the problem, gentlemen, all you have to do is to get away from any blind prejudices that you have that to build hard roads means to confiscate your property and just sit down and say we will not improve our roads and will stick to these old conditions, and use the good common sense that you have been endowed with, investigate the matter and get with your neighbor and make a plan which will equalize all the burden for yourself and others to secure the road. The bill of Mr. Brownlow that is now pending in Congress, is simply a factor to that state plan. "The National Government," he says, "has an interest in post and military roads, and wherever there is to be constructed a highway connecting two states, or in one state, in which the Government may have a special recognized road for military or for post or other purposes, then upon petition the Government shall come in as a contributing factor in the construction of that road. It enlarges the field and to that extent makes it easier for the communities to have the result desired, that is, good improved roads. I think it is a subject that should command your attention. I think it is a subject that demands your endorsement. If you will investigate it, if you will direct your Congressmen in that direction to look into it, it will be of commanding influence in directing Congress along that subject."

There are other forces besides that of the office of road inquiries, under the Government, that are now operating to stimulate this particular interest in behalf of road improvement. The department alone can only be directed in inquiring into the conditions, experimenting, educating, spreading bulletins on these matters of information, going into the several states (as it is my pleasure to come here) and talk to the people upon the subject of improving the roads, but in the Postal Department there is an improvement today that is having wonderful influence upon the road condition and must increase its influence from time to time. I now refer to the extension of the Rural Free Delivery. It has been and is a condition precedent to the establishment and maintenance of the Rural Free Delivery Routes, that the roads shall be in a good passable condition, and the Department assured our Division that they shall be more responsive from time to time on that subject. Mr. ——— has been with us at several of these conventions. He was with us at St. Paul. He is a very practical man and one who is very much interested in the subject of improving the roads and blotting out that which interferes with and destroys the efficiency of the service in the extension of the Rural Free delivery, and that Department is very anxious and is doing a great work upon this subject. The Rural Free Delivery is extending rapidly. It is a marvelous thing to contemplate what is being done in the United States in this direction. I understand now at the close of this fiscal year, that more than 12,500 routes will be established, that six or seven million people living in rural districts will receive mail at their door. These mail agents or carriers are really walking post offices and more convenient than for men living in small villages where they have not free delivery, because he comes to your door. He has envelopes, he registers letters, he takes letters and mails them, he does everything for you, he gives you the news of the day, he is really a travelling bureau of information. You do not have to go beyond your own door. And, besides, I understand that the Department of Agriculture will now add another feature which will be important to the rural districts. The Weather Bureau has endeavored largely to aid the farmer so that he may know something of the weather for the benefit of the crops. Heretofore they posted these signals in the towns, where the farmer would probably not hear of them until his crops were destroyed. Now the idea is to have these mail carriers who travel these postal routes to have these little signals upon their wagons or to carry them upon the peak of their cap, so that when they come to the door you may know as near as the weather fellows do what kind of weather you may expect. That is another very important feature and it makes practical the Weather Bureau, and that to some extent is what the Government is doing in the way of promoting this subject of road improvement.

The division is divided into four sections: southern, eastern, central, and the Rocky Mountain and Pacific Coast. There is one special agent appointed for these special districts. I have the honor to represent the Mississippi Valley States, and it is my duty to attend, as far as practical within the limited amount furnished by the Department, these various meetings if possible. I would be glad to go into every county and every state to meet the people and board of supervisors, and if possible to stimulate an interest along this line. I am glad, indeed, to find that the State of Missouri is aroused upon this subject. I am sorry to find, however, that there is such a large area of this State that is in the mud, and I am sorry to find that there are so few spots in the State, even in the very best counties, in which you will observe good roads. Really there is very little being done in the way of road building and road construction. The poorer the county, the more necessity there is for it to get good roads, because a poor county above all others cannot afford bad roads. You must have good roads to make anything out of your county. If you could go into some of these other states, if you could go into Alabama, referred to by Mr. King, and see what those people are doing, and I will leave it to these gentlemen here if there is a part of Alabama where the land will compare with that of good old Missouri; and still these people will bond these counties for $150,000 to $200,000—vote it right offhand—and put it into building their roads, and you can go there and it is just a delight to get into their wagons and ride all around. The pride of this class of farmers is in showing their roads. They indicate improvement in every direction; the people look brighter, the farm houses look cleaner—everything looks better—the darkies are more cheerful, and even the mules look you more squarely in the face. It is so everywhere. You used to be able to tell a man by the condition of his gate. It is the same with the common roads. But it would be idle to spend time upon that question. Every man I am talking to is in favor of improving the roads and every man is impressed with the importance and necessity of having them, and every man within the sound of my voice wants good roads. But the misfortune about it all is, we just sit down and don't have. What we want is action—practical action. Go down to the Legislature and study the details of these laws and find where the fatal place is and have that amended and make it practical so that you can go to work and do something. You cannot set them out by themeselves and let them work alone; you must have a law that has some force to it. The trouble about enacting laws and legislation is that the man who is most enthusiastic for roads is nearly always ready to surrender and lay down his principles; it is not what is right, but what will count for something. He needs to get action, he has got to have certain influences, the money must come from somewhere. The way to do it is to frame a bill that is practical, that means something, and have a legislature that will get out and do something, who will stand by it. If you cannot get it in one session, take it to the next. If you do not get it, go back to the people. The people are always in favor of having something. They want good roads just as much as you do, and are just as tired of the conditions everywhere prevalent, and are in favor of improving them. State your needs earnestly and fairly, do not surrender, do not lay down, stand up for what is right and proper and keep hammering at it. If you are not successful in getting it at one time, get it the next. But you keep surrendering. You have a bill that is all right—it reads fine, but it is like the fellow's flying machine—the machine is all right, but it won't fly. You want something that flies, that's the idea.

Now, gentlemen, I want to talk to you for a minute about this Brownlow bill. As I have stated, this comprehends the Government taking its part, having its share in contributing towards this co-operation for improving the highways, and the people have become aroused upon the subject. It is a growing subject and one that must come and I wish that good old Missouri would get in line with it. I would like to have you on the firing line early, would like you to be the first one to plant the flag upon the ramparts, that Missouri would be the very first petition that went into the Department for an improvement of the highways in this State. I have a copy of this bill here: I won't take time to read it now. It is for the co-operation of the different states. The first appropriation asked for is $20,000,000. The first appropriation made by the state of New York, I think, was about $100,000; the last appropriation was more than $600,000. The amount asked for from the next legislature of New York is $1,200,000; the state of Massachusetts is the same way. I only state this to show how this matter will extend and grow if it is given the start. The plan is following the general principles of the State Aid Law. Petitions are sent from the various states to the Department, and this money is apportioned to the states according to their population and more general interest, and that is of general interest to the Government, and the importance of public highways. The same principles apply to the state. The state reserves the right of inspection as to the importance of the road. Naturally enough, the main lines will be the first to have consideration, but whenever the main lines are built, then it follows in a short time that the less important will receive due consideration. If you get two or three main good macadam roads crossing the county, all going out into different directions, the rural route will eventually take care of the others. If people ever get a taste of good roads, they will never stop until they have all the necessary roads. The day of toll gates has gone by, so you had just as well eliminate that from the consideration of the building and maintenance of roads. That is a useless thing, so that you had just as well get away from the idea of toll gates—we had just as well wipe that off the slate for the people will not stand it. Kentucky and Tennessee tried to get rid of them until eventually they accomplished it. They tore them down—the people would not stand them. The county ought to buy them. The solution is an equalization of the taxes. Get away from this idea of putting it all on the farmer. I want to say to you with all due respect to thefarmers and their methods and the advancement they make, when I see the conditions of the road and know they have been in the hands of the farmer for a century and a half, and the result of their work, it does not commend them to have this work any longer. They have either got to improve their methods and evolve something themselves, or they will have to go to the legislature and have them adopt some new methods. The most sickly thing I know of is the demagogue going to the farmer as if he was a sickly, sentimental know-nothing and he had to go humming around sniffling to some one. The farmer is the very first man to spit on that sort of a fellow, and his days are limited. He likes a man who has some backbone, and likes something that gets results just like everybody else. You can fill the statute books full of laws and leave it to the farmer to pay the tax on his own land and confiscate his own property, and you will never have good roads. You must go to the merchants, railroads and big corporations that prosper upon the prosperity of the farmer, those who are interested, and who get the profit that comes from them, to pay something for these roads. There ought to be something back of the building of these roads, and when you get away from the idea that the farmer ought to pay all the taxes, you will have good roads. They talk to the farmer and say, pay your money and we will have good roads. When you go to town and these merchants begin talking about the bad roads, you tell them "You chip in and we will have good roads. I am not going to build all these roads for you." That is the proper way to do it. It is the right principle to apply. This bill comprehends that idea. I would like very much indeed if it has your endorsement. It is the endeavor to equalize the proportion everywhere so that Missouri stands just the same as Massachusetts, New York, California or any other state in the Union. This bill might not be perfect; I do not know that I could pick out any flaw in it; the principle is right; the Government has a great interest for roads. I know that in France, Germany, England and Spain, where they have magnificent highways, where the country is checkered with beautiful roads, beautiful homes, are found on every side, the peasantry are just as happy as they are in the streets of your crowded cities of today, from time to time the Government has aided in the construction of the roads. I know that that is where the result comes, and I want to say to you, gentlemen, that if you ever get a system of good roads where it is necessary to have good roads, you must have the National State and county co-operation.

Now, there is another matter I desire to present to you. The National Good Roads Association and the Department I represent, and I have the honor to be Secretary of the National Association, is doing everything possible to stimulate this movement; that is to get the people awakened to the idea that they are going to have these things and that is the first condition before you will ever secure them. They are trying to promote interest all over the length and breadth of this country.

DISCUSSION OF MR. RICHARDSON'S ADDRESS.

Col. Waters: I would like to refer briefly to some points brought out in this address. I would like to say to Mr. Richardson and all of you that we have scarcely claimed Missouri to have a very good law on the subject of building rock roads. That, I must confess, is the weak place in our laws. Our endeavor—the endeavor of this Association has been to begin at the beginning and inaugurate a road system at the bottom and I would say to him here now that this very question was discussed—the question that I spoke of this morning was discussed in the Pan-American Road Congress at Buffalo in September, 1901, of which he was secretary, and a gentleman from Pennsylvania, Mr. John Hamilton, the secretary of the Pennsylvania Board of Agriculture, said some things at that meeting I had intended to read to you this morning, but I did not get quite to it for want of time. Mr. Hamilton took precisely the same view of this question taken by the framers of the general road law of the State of Missouri. He was speaking of the question of state aid—endorsing it, it may be, but he made this remarkable statement in that great convention. He said: "Before state aid and before anything else can be done, and paramount to all, there must be competent *supervision.* It is the greatest folly to appropriate money which is to go to men who are incapable of spending it judiciously * * * much as I am interested in good roads, in Pennsylvania, if I were in the legislature and $1,000,000 or $5,000,000 were to be given for public roads, and its appropriation depended upon my vote under our present system of *supervision,* I would vote 'No.'" (Applause.)

We in the State of Missouri are getting upon a business basis. I do say that the law, in so far as a primary organization of our road management is concerned, is built upon business principles, and when we have proved our ability to carry on our business, as we may, then I am in favor of going to the legislature and asking assistance from the State. I believe it is going to come, but it will not come and ought not to come until we have proved to the world that we are competent to disperse the funds upon our roads and get one hundred cents worth of value out of every dollar expended, but that day is coming, too. We have not in the past emphasized very much the building of rock roads, not because they are not of great value and almost absolutely necessary and are going to come, but we have endeavored in the past to build a foundation and to educate ourselves in the primary department, if I may use that expression, so as to get up to this more advanced matter, and I am glad to know that we are moving along in that direction, and I am more than glad that we have the presence of the gentleman from the Department of Agriculture in the United States with us to help us along in the agitation of this question.

If any of you gentlemen will take the pains, if you are yet doubtful and skeptical as to the character of our present law in the State of Missouri, to follow Mr. Hamilton in his discussion of the very same question, you will see that he is on precisely the same track that Missouri is on in that direction, and the law that he was talking about was adopted only in 1897, and had not yet been operated in Pennsylvania, but was just beginning then.

As to state aid, what does it mean? It means that the farmer would not have to bear all the burden of road construction. It would mean, if the money was contributed and appropriated by the State, the city of St. Louis, which does not now pay a dollar of tax for our rural roads, and also Kansas City and St. Joseph, and the great interests of the State, the railroads, the telegraph systems and all of these taxable franchises would put into the roads of the State of Missouri four dollars to where the farmer would be required to put in one, and that they have an interest in the roads is evidenced by Mr. Richardson's address; therefore, it is the proper thought for us to work in that direction, and first to put ourselves in a position to use these funds so as not to squander them.

Now, as to the laws that have been made for the purpose of constructing rock roads and other roads, the law that Mr. Richardson referred to has been on our statute books about twenty-five years, and I think I am safe in saying that no road was ever built under that law.

Mr. Gabbert: We have had rock roads built thirty-five years, but not under that law.

Mr. Waters: Any way our Association is not opposed to that law. Let it stand there. But we have not yet thought out or been able to think out a law that we think is applicable, but we are coming in that direction. The time is coming when we will have a law that will enable us to build good roads.

Now, as to the Government—any of you that are reading, and I think all of you are, can see the signs of the times, and how it is that these influences have come about which have caused one of the greatest steps forward that has ever been made by a civilized country, so far as the farmer is concerned—the Department of free rural mail delivery. There must follow closely upon its heels some interest taken by the Federal Government in the very roads over which these rural routes are established.

I do not know precisely the nature of the Brownlow bill. The rural routes would be post roads and we now have something which catches on to the constitution. We have a constitutional cover for our rural routes. When they wanted the Government to make an appropriation for the great turnpike that started from the east and came through Wheeling—the Cumberland-Pike, the President fought it and said it was not a post road, and therefore a government appropriation was unconstitutional. Every one of these rural roads is a post road and we have therefore a constitutional right back of us.

Mr. King: I am a farmer myself, but I desire to at least apologize for the poor management of the roads by the farmers and offer an explanation. About twenty-two or twenty-three years ago I knew a young fellow who got married and he and his wife went to housekeeping on the farm in a one-room house, say twelve feet one way and thirteen and one-half feet the other. They rolled the mattress up in the morning and tied it with three strings and stood it in the corner during the day, and when the older members of the family came from the East to visit them, when it came time to retire they went out the door and around the front of this one-roomed establishment and went up a ladder and into the half-story through a half window and slept on the ceiling. Now, gentlemen, the United States is only just beginning to keep house. Can anybody tell me how old the rural routes are? This country is only five hundred years old from its birth, let alone its wedding day—let alone the time it has been housekeeping—only five hundred years from its birth. Washington is only four hundred years old. How old is Rome? The roads of Rome were built 750 years B. C., and it is 1903 years since Christ. Please do not blame the farmers because they are still keeping house in one room in America. We are going to do better, and that is what we are here for today, to learn to do better.

Mr. ———: I did not get what Mr. Richardson considered to be an equitable ratio between the General Government, the State and the county and the farmer—the equitable proportion that it takes to build these roads. Under your system you proposed to let the general Government, the State and the county and of course the farmer all assist in building the roads. I did not catch the ratio.

Mr. Richardson: There are different rates in the different states. In New York the general fund pays 50 per cent, the county 35 per cent and the abutting property 15 per cent. In some of the states the general fund pays 33⅓ per cent and the rest is prorated between the county, the township and the abutting property, making about the same ratio. The Government comes in for its portion. I do not know that the question as to just what the ratio will be has yet been determined upon.

You will understand that the Government interests would not be a factor in the construction of all the roads of the State, but only in those main roads that the Government might regard as of some military or postal advantage. When that is done, the amount will be prorated equitably between the State, the county, the Government and the abutting property. I do not know exactly what the rate should be, but I should think it very fair to say that the Government and State would at least carry 50 or 60 per cent of the cost.

Col. Waters: I now wish to read the report of the Committee on Resolutions. I will say of this report that these resolutions represent the results of this discussion and will go out into the world as our sentiment.

REPORT OF COMMITTEE ON RESOLUTIONS.

Whereas, the State Board of Agriculture has for several years taken an active interest in promoting road improvement and has co-operated with our State Road Improvement Association; and

Whereas, there is a lively awakening throughout the State in progressive activity in bettering the condition of Missouri roads; and

Whereas, we believe now is the opportune time for vigorously pushing the good work; therefore,

Resolved, that we endorse the work being done by the Board of Agriculture and emphasize the necessity of largely increasing and widening it, and to that end we recommend that at least two thousand dollars be appropriated by the present General Assembly to carry out the work for the next two years.

2nd. In the light of continued experience we emphasize the demand that all revenues for road purposes be collected in money.

3rd. The progressive methods put into practice in the different counties of the State create the necessity for increased revenues. We therefore recommend that the extra 15 cents allowed by the constitutional amendment be levied for road and bridge purposes.

4th. As a principle in road maintenance we recommend continuous care of the roads all the year under the contract system, or hired labor.

5th. The method of keeping the roads smooth by some suitable drag having been demonstrated to be eminently practical and efficient, we heartily recommend it and especially urge upon every road district in the State to give the plan a faithful trial.

6th. That we favor a law in this State that will provide State aid in the construction and maintenance of improved roads in Missouri.

7th. The Missouri Good Roads Association in annual meeting at Springfield, January, 1903, hereby gives its unqualified endorsement to The National and International Good Roads Convention called by the officials of the National Good Roads Association, The Office of Public Road Inquiries, Department of Agriculture, State of Missouri and City St. Louis, The Louisiana Purchase Exposition and the business and railroad organizations of the State, to be held in St. Louis, April 27th to May 2nd, 1903. And believing that the public road interest of the State should be adequately represented in said convention, therefore, be it further

Resolved, that this Association appoint five (5) delegates and five alternates from each county in the State, as representatives in said convention, and that the Secretary be instructed to forward list of names of said delegates so appointed to the National Secretary at St. Louis.

8th. Recognizing the value of National and State aid in highway improvement, and believing that the National Government has an interest in improving military and post roads; therefore, be it

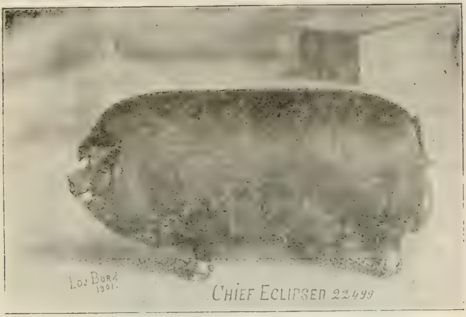
Resolved, that this Association fully endorses the principles of the "Brownlow Bill," now pending in Congress and requests that the members from this State give favorable consideration and support to the same, and that copies of this resolution be sent to each members of the Missouri Delegation in Congress.

THE IMPORTANCE OF RELIABLE PEDIGREES AND THE INFLUENCE OF RESPONSIBLE BREEDERS.

(By E. E. Axline, Oak Grove, Mo.)

This I consider one of the most important subjects now facing the breeders of pure bred stock. An unreliable pedigree is worse than none at all. And a pedigree from an unresponsible breeder is the same as none. While I do not think there are many breeders of pure bred stock who are unreliable, I am satisfied there are some who do not feel the responsibility resting on them in the making of true pedigrees. About all there is in making a pedigree is a man's honor and integrity, and all depends on his honesty. A true pedigree not only shows the blood lines of an animal, but it also shows the lineage of individuality each ancestor possesses. An untrue or unreliable pedigree does not really show anything at all, as all its showings are false and cannot be depended on as true and really is of no value whatever.

Nothing is more important to breeders of thoroughbred stock than a reliable pedigree from a responsible breeder. A reliable pedigree must come from a reliable and honest breeder. Such cannot or will not come from a careless, negligent, or untruthful person, and a reliable pedigee must come from an honest, truthful and responsible party. A responsible or reliable breeder will not under any circumstances misrepresent the breeding or individuality of an animal (knowingly) in making a pedigree. There is no breeder who should not feel a great responsibility when making a pedigree. A true pedigree depends altogether on a person's honesty and ability and his knowledge of the individual and its ancestors. There should be no guess work in making a true pedigree. All things pertaining to the individual and the ancestors should be a matter of record and a person's recollections should not be depended on for anything. It is true some can remember a great deal, and might write true pedigrees from memory, but I do not consider this a safe way, and not reliable. All dates, marking, number in litters and color should be a matter of record, and memory should not be depended on for anything. An animal *cannot have but one true* pedigree. I have been a breeder of Poland Chinas for over twenty years, during this time I have seen a few hogs (Poland Chinas) with more than one pedigree. A case when one animal was owned by several parties at different times, each owner would give a pedigree of his own regardless of its true breeding. As an illustration: Several years ago I sold a very fine individual, but plain bred sow to a brother breeder in a neighboring state. She had been bred to my best boar on a certain date. Shortly after I sold her, I attended a combination sale in this neighbor state in which the party that bought my sow had a con-



One of Mr. Axline's Herd Boars.

signment. In looking over the offering before the sale commenced I noticed a very familiar looking sow. I recognized her easily as being the one I had recently sold to the brother, who had a consignment in this sale. In one ear I found an ear tag corresponding to a number in this sale catalogue. In the other ear I found a hole where my ear tag had been. The breeding in this catalogue was altogether different from what it was when I sold her. Instead she was represented as being sired by a noted boar belonging to the present owner, and was represented as being bred to another noted boar on same breeding date as given in my catalogue to my boar. This I considered an unreliable pedigree from an irresponsible breeder. This is only one instance, but I am sorry to say that I have seen several similar cases. I am glad to know such breeders are few and this kind of cases are not general, but it goes to show what has been and what can be done, and that all depends on honor and honesty. As a believer in honesty and uprightness and being a little superstitious, I believe the old saying, "Murder will out," and I believe all such breeders as above mentioned will soon be found out and will not last long. And this is as it should be. As breeders of pure bred stock (especially of hogs) let us not think we can be too particular in keeping records of every thing pertaining to making a true and correct pedigree of every individual, and may we ever ignore and disapprove of dishonesty in any form, and may we always feel that all depends on honesty and integrity, in making true and correct pedigrees.

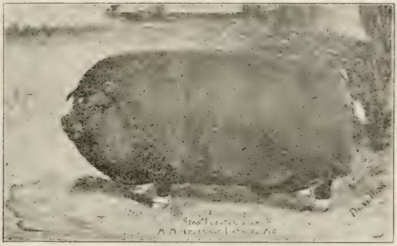
TREATMENT AND FEEDING OF PREGNANT SOWS.

(By M. M. Anderson, Lathrop, Missouri.)

Mr. President, Ladies and Gentlemen:

I feel a delicacy in attempting to address an audience of as much intelligence as this, composed as it is of men of so much more varied experience than I have, men who have been successfully feeding and handling brood sows for a much longer period than I have; men who, by their intelligence and strict observation and by strict adherence to common sense methods of feeding and sanitary rules and regulations, and by studying closely the effects of proper mating, have attained to the heights of fame in the hog world, and whose names are a synonym for the best type of the American hog.

But to my subject. To begin with, I will say that the treatment and feeding of a pregnant sow for the best results should begin before the sow has been bred. Her treatment and feed prior to this should have been such that she will be in a thrifty condition, but not fat. After she has been bred, she should have a quiet place to herself for two or three days, after which she should be allowed plenty of range. If in summer, she should be turned on good pasture (clover preferred). If she has this and has access to plenty of fresh, pure water and shade, she will need but little else until farrowing time, when she should be provided with a comfortable house in which to farrow. After this her treatment does not come under my subject. If she has been bred in the fall when she cannot have the benefit of fresh pasture, this should, as far as possible, be supplemented with succulent foods, such as sugar beets, mangels, oats and mill feed. As in summer, she should have plenty of range with comfortable quarters in which to sleep, with not more than four or five to bed together.



One of Mr. Anderson's Herd Boars.

A good plan and one that I have found to be profitable to take the place of clover and other summer pasture, is to sow a field to rye or wheat on which sows can run during the winter and early spring. The propriety of feeding rye to sows that were in farrow has always been a debatable question, some claiming that its use would cause abortion, but I have been feeding it more or less to my brood sows for a year or two, and no bad effects have followed. I would like for the discussion that shall follow to be as elaborate as possible on this subject. If anyone has observed any bad effects following the feeding of rye to brood sows, I would like to know of what nature and under what conditions and circumstances.

My manner of feeding it is to grind and mix it with skim milk and such other kitchen slops as I may have, and if there are not enough of these, I make up the deficiency with pure water and soak twelve hours, or from one feed to the next. I find this, where I have raised the rye myself, to be much cheaper than buying bran and shorts at the prices which have prevailed for the last few years on these commodities.

DISCUSSION.

Mr. Canaday: I do not think that I can say very much and especially about feeding rye. I have been afraid to feed it and for that reason I have had no experience with it. I feed it to pigs and other hogs except pregnant sows, and I would not advise it because I have been taught that it was a little bit dangerous for hogs and horses as well.

Mr. Anderson's paper has taken up all the ground, so far as I know. His management is good. I do not feed beets or anything of that kind, but I think it would make a good feed. I have a wood pasture and clover and blue grass, and I have arranged a run of one-half mile; that gives them plenty of exercise, and I think that is worth almost as much as good feed, and of course they find something in the blue grass pasture and clover field. I always give them a run to pasture and a moderate feed of corn. I do not want my pregnant sows to be over-fat, but I put them in good condition for the time of farrowing and I have had extra success in saving my pigs. If a man does not lose sleep by staying awake to watch over his sows, he need not expect extra success in raising his pigs for there is a great deal of danger of the sow over-lying her pigs.

There is another thing I would like to mention and that is not breeding the younger sows until they are at least eighteen months old. If she is bred when but a year old, she does not have a very large litter and she suffers from swelling of the teats that do not give milk; but if you let your sow get fully developed before breeding her, she ought to raise a full litter.

Prof. Mumford: There are one or two things about the subject of feeding rye that are pretty definitely determined. In the first place, there are a great many breeders of swine who feed rye very extensively to their pregnant animals, and safely, too. On my own farm I have been feeding rye for five years, feeding it particularly to pregnant sows and feeding it a great deal; but sometimes, and most frequently in a wet season, a fungus develops on rye which is called ergot, and when that fungus develops, it is a very dangerous thing to feed rye, for in pregnant animals it is almost certain to cause abortion. Now this fungus grows out in the same place where the grain should grow and it grows much larger than the grain usually. I have seen this black crescent-shaped fungus an inch long and from that down to half an inch long and when there is any great quantity of that fungus on rye it is easy to see it at harvest time and it is dangerous to feed it to any pregnant animal, but when that fungus is not present rye is undoubtedly as safe to feed as any other grain, in my judgment.

Just one other thing which does not bear upon this question. We know in the Eastern markets the buyers discriminate against rye-fed hogs, hogs fattened on rye, and they will pay more for corn-fed hogs. It does not have anything to do with this question under discussion, but it is rather an important point after all.

Mr. Gabbert: I am not a hog raiser, but I would give rye the go-by. You can raise more wheat to the acre and twice as much corn, and I don't see why men want to fool with a feed that is dangerous. I am not a hog raiser, but I would not feed rye if I were afraid of it.

Prof. Mumford: Under the conditions of my farm I can raise more rye than wheat, and I raise rye rather than depend on corn because rye is a better balanced ration for feeding animals. It is harvested before corn is ready, for we usually have the corn fed up before the next corn crop comes along, and another reason for growing it is that it gives a variety of feed. I do not pasture it with hogs, when I cut it for grain, and when I use it for pasture I do not cut it for grain.

Mr. Anderson: Take it one year with another, it is a more certain crop than wheat.

Prof. Mumford: Undoubtedly.

Mr. Gentry: I have always understood, as Prof. Mumford says, that it was the ergot in the rye that was dangerous. When you buy the fresh grain you can tell whether it has ergot in it.

Prof. Mumford: Yes, you can see the grains of fungus. It is a lump. It is not like smut, it retains its shape, and you can readily distinguish it. It is a hard grain, usually considerably larger than a grain of rye, and much of it is screened out and it does not develop in any ordinary season to a dangerous extent, but it does in very wet seasons.

Mr. Gentry: Like Mr. Gabbert, I have not had much experience in feeding rye. I was always afraid of it and as long as there is anything else, I do not feed it.

In the fall of 1873 I purchased in St. Louis the champion Berkshire sow for all breeds, winning the Pork Packers' prize and as best sow of any age or breed. She was well along in farrow when I took her home and I was feeding her rye and the man by accident let her get through the gate and get a big dose of rye slop and she aborted. I never knew whether or not it was the rye. It may have been, I do not know.

I have never found any slop yet that I think is the equal of corn, wheat and oats ground together. The rye might be just as good as the wheat, but I think no better. There is practically no danger in the wheat. But aside from that, my own experience has been different from what most men advise in regard to feeding sows in farrow. I never have believed in feeding much slop. The agricultural papers say, if it does not suit you to feed your pregnant sows corn, give them slop. I don't believe it is a good way. I believe the reverse is exactly true. I have talked with Mr. Snell of Kansas, and I told him my method and he agreed with me that if you feed altogether slop, or slop largely, to sows in farrow you have a great many dead pigs. They are apparently well developed, but they have no strength. I have seen a whole litter of a dozen pigs and every one dead from feeding the sow too much slop. That, of course, is uncommon. I lost two or three of the finest sows I ever raised by not giving them a grain of corn when in farrow. I had been showing them and they were pretty fleshy and I kept the corn away from them entirely. One was an imported sow. They did not produce a pig. That is my opinion of what slop will do. I love to feed the old-fashioned Missouri corn. Corn is consumed largely in keeping up the animal heat. I can feed corn during the winter months and it is not dangerous as it is in summer, because it is consumed in keeping up the animal heat. But I believe in slop feed for sows not in farrow. I like to see a sow not too fat in time of service, but she must be in a thrifty, gaining condition for the pigs to be strong and active.

If your sows are in farrow, you don't want to feed much slop. Wheat bran is enough if they can get to the grass. That and corn is all they want. I do not keep my younger hogs fat, but I give my sows and pigs plenty of corn and feed liberally and let them get fat. But if the sow is fat at the time of service, you cannot give her corn every day in order to produce pigs. Sows are thin as a rule when they are bred and are thin after having raised litters; but I believe in liberal feeding and letting them get pretty fat.

Mr. Ellis: There was a statement made by Mr. Mumford, I believe, that should be explained. He stated one reason why he raised rye was because it was more productice than wheat. People here do not understand that Prof. Mumford's farm is in Michigan. That condition is not true in Missouri, for the average yield of wheat in Missouri is greater than the average yield of rye. In this State—and in talking with the farmers I find they agree with me—we can get as much out of wheat for pasture as rye. Mr. Shepard, who is largely engaged in the dairy business in Boone county, keeps about seventy cows and pastures them a great deal on wheat during the winter. He stated a few weeks ago at the Dairy meeting he thought he could get more benefit from a field of wheat for pasture than from a field of rye, and I can corroborate what Mr. Gabbert said that we get a larger yield of wheat in this State than rye. It is different perhaps farther north.

Mr. King: I have been raising hogs like an ordinary Missouri farmer for the market and I agree with Mr. Gentry that the sow would fare better if she looked a little too fat than if she is not fat enough. It is a wonderful mistake that is made by the average farmer that a breeding sow should be kept thin. Plenty of feed and unlimited exercise is the best thing for the sow and for the little pigs. I have practiced a limited feeding of corn and scattering it—and when I say scatter I mean scatter. I have sent men out to scatter oats and wheat for my hogs and told them: "Now I want this scattered so the sow cannot get but one grain at a time," and they would string a half bushel in a string forty feet long and be careful to put a half bushel in a straight string. If I am feeding brood sows I scatter wheat or oats or rye for the purpose of securing exercise—I scatter a handful at a time.

Mr. Ziegler: Would it pay to grind the wheat instead of scattering it? If ground, would it be better to feed it dry or make it into a slop? I don't know how to feed it when it is dry, but I moisten it a little.

Mr. Gentry: In the fall of the year and early winter when there is a lot of grain and grass, I would not feed any slop at all, but weather like this when they cannot get anything but dry corn, I feed slop, largely bran, something that will make it bulky and keep the bowels open. If you feed them in a house where the wind does not reach the feed, you can feed it dry and let them have water, for in winter the water freezes up. I have seen instances where men fed dry ship stuff. A Poland China breeder says the fattest lot of pigs he ever saw were fed on dry ship stuff. In winter the water is apt to be frozen and I like to have slop to make a balanced ration, and also give them a drink of water. The water may be frozen and they cannot get a drink, but give them a drink once a day. But in the fall of the year when there is plenty of grass and water, corn is all they need; that is an aged hog. For a young hog that won't do. You cannot raise a hog exclusively on a corn diet. Corn makes fat and there is nothing as cheap, but to make a fine animal you ought to have a variety of feed.

Mr. Canaday: I would like to hear from some of the breeders concerning the bed for the pregnant sows. My plan is to have a very large shed for them to sleep in so they will not group up. I believe there are too many small houses or beds for the sows to sleep in, they pile up and crowd one another and the small ones especially have a poor chance. This fall I built a house twenty-four feet long, fourteen feet high and sixteen feet wide on the hillside or in the timber with the south side open three or four feet high and the other sides all closed tight. I covered it with rails giving good pitch and covered that with hay, leaving a double wall on the north and at the two ends; filled first between the walls with hay tamping it in and covered the whole thing with hay or straw. It makes a nice warm place and does not sweat the hogs and they do not crowd one another, but if one jumps up the others get out of the way. The shed must be large enough for the sows at farrowing time and they should have plenty of room, so they will not have to turn on their pigs to get out of the house. I think this is an important subject and has been a pretty costly one to me in my time.

Mr. Anderson: I want small houses so there will not be room for more than three or four sows to get into one house, not room enough to make a pile. If you have a large house and room for fifteen or twenty or more sows, they will naturally pile up when it is cold, but where there is not room for more than three or four they will not pile up.

Mr. Canaday: My pasture is large for sows and it is better to let them all sleep in one house than to cut it up into smaller houses, they can get a better range. I have twenty or thirty sows to sleep in this large bed. I do not hear much fuss. They are well acquainted and each one knows her master. If they are separated awhile and then put together, they will fuss. I can pasture them to better advantage by letting them all run together and it would be quite a job to separate them all at bed time. At pigging time, of course, I separate them before bringing pigs.

Mr. Anderson: Let as many sows on the same pasture as you want to, if you will just have the house, they will divide themselves. Have the house so that not more than three or four can get into one house and only three or four will get into the same house.

Mr. Ziegler: My best success has been with the small houses. I used to raise hogs, quite extensively, though not so many as I would like to have raised. I had the best success with houses seven by seven feet, built in an A shape, very deep and very steep with a slat or rafter at the top and a door in the end. I could move these houses around wherever suitable and by pigging time would move them around in my pasture and bed them well, and my sows found the way in and when they were in, I made hurdles by nailing three boards together so I could shut them right in, I put one at each side and two together in front. I could shut up my sows in there and they would do well; they would squeak in my ears, but I had no trouble in keeping them there, and I would bring feed, water and slop to them or whatever I fed them: and where I had a great many sows and more or less of them had pigs right close together, I doubled them up after the pigs got about a week old, and put two sows in one house. The reason I built them A-shaped is, the first ones I built square and roofed them over and the sows would over-lay their pigs, but the A-shape would keep the pigs on each side so the sows could get around. I fed clover hay in the winter time, nice good clover hay, and the sows relished it very much when I had no grass.

Speaking of Missouri corn, I have not fed any of that, but we fed a good deal of Peoria corn, and you know what effect that has on a man.

WHAT THE UNIVERSITY OF MISSOURI IS DOING FOR THE FARMER.

(By Dr. R. H. Jesse, President University of Missouri, Columbia, Mo.)

Ladies and Gentlemen: The subject which is assigned to me for this evening is a very large one, because the farmers of Missouri are very numerous, the agricultural interests are diversified and the University is helping the farmers along a large number of lines.

The College of Agriculture is the best investment, so far as I know, that Missouri, as a State, has ever made. She has put into it, according to the best of my calculation, in the thirty-two years of its existence, a little less than three hundred thousand dollars; that is all that the college has, up to date, received from this commonwealth, but the college has received from the Federal government in thirty-two years eight hundred and fifty thousand dollars, and it received also one hundred thousand dollars from Boone county, making a total of nine hundred and fifty thousand from the Federal government and from Boone county. The State has contributed three hundred thousand dollars, that makes the total received by the University up to date on account of the college, a million and a quarter of dollars.

The College of Agriculture is endeavoring to help the agricultural interests of this commonwealth in a number of ways. Horticulture is so large an interest in Missouri that we cannot possibly neglect it. Our contribution to this industry has been large and varied, unfortunately the people do not understand it. I know that most of you are breeders of live stock and I shall talk on that subject in a little while, but I beg your leave to say as a preliminary, some of the things that the college has done for the fruit growers in Missouri. I suppose that when the fruit crop is killed at all, it is killed oftener by warm days in February and March, causing the buds to swell, and afterwards by stinging freezes —that kills the fruit crop in this State and especially the peach crop oftener than any other single cause, and our college has discovered a way, a very simple and inexpensive way in which that may be avoided by any man who wants to avoid it. You have only to spray your trees when the warm days come in February or March with a mixture of common white wash and a little glue applied with a spray pump, any farm hand can apply it, and I will guarantee to you that the remedy is effectual. It is indeed a great discovery, but like other great discoveries, it lay at the feet of the people for a long time until the college took it up. Coming to America was a very simple matter as soon as Columbus made the first discovery. The telephone is becoming a very simple matter since Bell has invented it; and so this method of saving the fruit crop is very effectual and the college at Columbia discovered it first. The Bulletin in which this experiment is described has been called for by almost every civilized country in the world in which orchards are subject to winter killing. It has been called for by nearly all the countries of Northern Europe. It has been called for all over the United States and Canada and a large German University gave Prof. Whitten the Ph. D. degree last spring upon a thesis written on this subject. It has excited great attention in the Department of Agriculture at Washington. It is a very simply remedy based on the scientific knowledge that when a tree is white it will not absorb much heat; when it is green it absorbs heat very rapidly; if, therefore, you leave your trees the natural color they absorb heat at a great rate, but if you whiten them they do not absorb heat enough to swell the buds. Any man in Missouri whose orchard is suffering from winter killing can protect his orchard by that very simple but effectual method.

Again, in many parts of this State the woolly aphis has created great damage in many orchards, very many, I believe in South Missouri. No entomologist on earth ever discovered a remedy for the woolly aphis until Prof. Stedman began to investigate it at Columbia. He discovered two very simple, economical and effective remedies for combating the woolly aphis. If you or your friends are troubled with this pest, all you have to do is to write Mr. Stedman at Columbia, and he will give you two very effective remedies for the woolly aphis.

The fruit tree bark beetle has appeared in Missouri in recent years. I do not know when it first came, but in late years it has been creating great ravages among the orchards of Missouri. We have discovered a remedy for it. If, therefore, your orchards are attacked by the fruit tree bark beetle, all you have to do is to send a postal card to Columbia and we will tell you how to deal with this pest. The fruit tree leaf roller is now perhaps creating more damage among the orchards of South Missouri than any other known insect. It has appeared recently in dangerous quantities. It crossed the border from Kansas—a great many bad things come from Kansas and some good things, too—but we have discovered a remedy for the fruit tree leaf roller pest, and if your orchards are troubled with that pest, it will cost you one cent to find out how to protect your orchards against this pest.

The curculio, a creature that stings the apple, has been doing great damage in the Ozark region, and many of the apples of the Ozark region are now classed as No. 2, instead of No. 1, on account of this insect. If you are troubled with the curculio, send a postal to Columbia and we will tell you how to dispose of him by a process cheap and easy of application. The great trouble is that the fruit growers of this State, in spite of the vast amount of literature that we send out, do not seem to know that there is an Experiment Station at Columbia that stands like a wall of defense between the orchards of Missouri and the pests that prey upon them.

San Jose scale made its appearance in Missouri eight or ten years ago. The history of it is a little interesting: The Federal government issued a bulletin charging a firm in Missouri with having distributed this pest over the State. We investigated the matter and proved most conclusively that the nursery in question had not distributed the scale at all, but that it had been distributed by a New Jersey firm which had sent them some stock damaged by San Jose scale which they refused to accept; but instead of having it sent back, they distributed it among all their buyers in Missouri and the San Jose scale was distributed in that way, and in our bulletins we cleared the nursery of that charge. We tried in vain to wake Missouri to the danger of spreading the San Jose scale over the State, we tried to scare the Legislature, and there is reason for the people to be scared abuot it, but the Legislature said, "They want an appropriation up there at Columbia." We do want it. We want one to hold the San Jose scale in check. The station in the University has been fighting single handed for six or eight years against the San Jose scale, and while it is increasing in Missouri, it has been increasing at a slow rate because of the work that we have done. When a man writes us that the San Jose scale seems to have appeared in his orchard, then the entomologist takes the next train for that place. If the man will not pay the expenses of the entomologist, we pay his traveling expenses ourselves, for the San Jose scale is not a thing to be trifled with by anyone. California would give millions of dollars to free their State from this pest, but the slow spread of this pest in Missouri is due to the fact that the Experiment Station at Columbia has fought it at every point where it can gain information of its appearance.

I could go on and tell you of a great many other things. An important one is an experiment of raising asparagus in the open air in the dead of winter which has proven to be very profitable to market gardeners in the neighborhood of St. Louis. We estimated that an acre planted in asparagus, according to our method of planting and treating it, would have yielded in that winter, in which we made the experiment, nineteen hundred dollars an acre; that depends on the time of the year, the price of asparagus and how many fools will spend money for asparagus in the dead of winter, but there are fools enough in the city to do it and the market gardeners in St. Louis are making fortunes on account of these fools and it is a good thing for these gardeners that these fools will spend their money this way.

Let me go on a little from Horticulture to Animal Husbandry. You know very well that Texas fever infects cattle below a certain belt of temperature all over the world. Why they call it Texas fever I do not know, probably because Texas is a very large State and there are a great many cattle in Texas; but it attacks herds in Georgia, in the Carolinas, Florida, in Porto Rico, in Cuba, in Australia and in India just as well at it does in Texas. The theory was advanced, a mere theory which nobody had been able to prove, that this fever was caused by a tick which was produced in southern latitudes. The cattle born south of this line and accustomed from birth to this tick became immune to the fever; it did not affect them, but whenever northern cattle were shipped in, they fell victims to it in about ninety cases out of a hundred and when southern cattle were shipped north in the summer time they spread the so-called Texas fever. Our Station took hold of this trouble in co-operation with the Experiment Station of Texas and in co-operation with the State Board of Agriculture of Missouri, so that the State Booard of Agriculture of Missouri, of which Mr. Ellis is Secretary, the Experiment Station of the University at Columbia and the Experiment Station of Texas co-operated in a series of experiments on Texas fever. We did the scientific work and the Texas Station furnished a good portion of the money, for it was a very expensive experiment and the State Board of Agriculture helped us at every point, but our Veterinary Surgeon did the scientific work and it was proven for the first time in the history of the world, it was proven conclusively by a series of scientific experiments of the severest character that Texas fever was caused by the tick and by nothing else under the sun of heaven and when it was found necessary to give the average Missouri cow Texas fever, we found in general that half a dozen ticks would give it and twelve or thirteen were dead sure. That was not a very great performance, we proved by very vigorous scientific demonstration that the hypothesis which had already been advanced was a true hypothesis; but we went a step further and did one of the best things that has been done in a century in veterinary surgery. Our veterinarian discovered a method by which cattle in Missouri or from any other state can be inoculated against Texas fever and shipped south at any season of the year with comparatively little risk of death, so that whereas in the former days about ninety per cent of the blooded stock sent south from Missouri to Texas died of Texas fever, now about five or six per cent of the inoculated animals die. That has opened to the raisers of improved live stock in Missouri a large southern market which was effectually closed against you in the past. A large number of men have taken advantage of it, a vast quantity of improved and very expensive live stock have been shipped into Texas after being inoculated, and one breeder of English cattle, buying cattle for the far South, put it in his contract that the cattle should be shipped to England by way of Columbia, Missouri, and inoculated before they were delivered to him.

Some years ago the Australian government sent a special agent to the United States to find out what our Department of Animal Husbandry at Washington had been able to do in combating the Texas fever, and when the man got to Washington they sent him immediately to Columbia, Missouri, saying that that was headquarters of the earth for work in Texas fever. He came and he was satisfied.

Now the fact that more cattle have not been inoculated and sent to Texas and other portions of the South is due to the fact that our duty is to make scientific experiments. The misfortune about this inoculation is (and I want to tell you this very frankly) that the farmer cannot possibly inoculate his own cattle, but the inoculation has to be done by a man who understands the business, for you can kill cattle by inoculation as well as you can kill them by Texas fever direct. Now our veterinary surgeon, the man that was capable of making a discovery of that sort, cannot give up his whole time to inoculating cattle to be shipped into Texas, but if the State would only make an appropriation —we are not going to ask them for it—but if Missouri would only make an appropriation for inoculation at Columbia that would warrant us in employing a number of men to conduct the work—not so skillful as our head veterinarian, and yet skillful enough, we would undertake it very cheerfully. When we inoculate cattle, we do not charge anything for the inoculation. We charge for the board of the animal, the hay and grain that he eats, and he does not eat much for he is sick during the process of the inoculation: and once in a great while, one in a hundred of the animals die in the process. We also insist upon having a groom sent along with the animal to take charge of it under the direction of the verterinary surgeon.

A man capable of making a discovery of that sort we have engaged on other sort of work, and he is now trying to find a remedy against the hog cholera and other diseases. We cannot afford to let him take his time inoculating cattle.

Before the close of the last century, a veterinary magazine of prominence in veterinary science, in summing up the development in veterinary science during the last hundred years said there have been three great discoveries in veterinary science made on earth during that time, and one of them was the method of inoculating against Texas fever discovered by John W. Connaway at Columbia; and, by the way, he was a Cedar county boy without much training. He took the train to go to Warrensburg and make a teacher of himself, but before he got to Warrensburg, somebody suggested to him that he go on to Columbia. He came and has been there ever since he graduated. He refuses offers of a larger salary. He declines and does not say anything about it, and he is so busy in scientific discovery that it is a matter of great difficulty to hunt him up and deliver his check to him. We have raised his salary and raised his salary and he has never known anything about it until his check came in for a larger amount and his salary has never been discussed between him and the other officers. The University really ought to pay him more than we do.

Now most of you are cattlemen; you are experienced in that line, and you know very well that, while I take immense interest in it, I am not an expert in cattle feeding, therefore, to be frank with you, I am afraid to go into too great detail for fear I should get something wrong. I had just as well start out by telling the truth. The cattle feeding of the Station at Columbia is, so far as I know, unexcelled by that which has been done at any other station in the Federal Union. That is general and that is also modest. If you will tell me a station in the Federal Union that has done better work in the last seven years in experimental cattle feeding than has been done at Columbia, Missouri, I would like to know the name of the station. I won't contradict you, but for my information I would like to know where that station is located. Some good work has been done at Wisconsin, some at Ames and some at Minnesota, good work may have been done at other places, but I am telling you the truth as I know it when I say the best work that has been done in the Union in experimental cattle feeding in the last seven years has been done in this State and at the Experiment Station. Now we are not done, we are not beginning to rest on our laurels, but we have done very fine work, and I gather this from the statements that are made to me by other stations and from the statements which are made to me by large and very influential cattle feeders in this State and also I gather this from this additional fact which I will proceed to tell you of now.

The United States government has, at Washington, a Department of Animal Husbandry which concerns itself with all questions of the feeding and breeding of live stock and a good many more besides. The government at Washington is not able to do there all the work that they want done and they go into what they call co-operative work with a large number of stations over the country. For instance the government is now co-operating with us at Columbia on an irrigation experiment. That may surprise you. It has cost the government a good deal of money; they furnish all the money for labor for constructing reservoirs, etc., and we do the irrigating and observe the results, write the bulletins and the government publishes it as United States bulletins on irrigation written in co-operation with the Columbia, Missouri Experiment Station.

The largest cattle feeding experiments that the United States government has ever undertaken in its history it has undertaken this fall, and it has selected the Experiment Station at Columbia to conduct that experiment. The government furnishes fifteen thousand dollars per annum to pay the expense of these stations. We have to report to them what we do and they send every year a special expert out to inspect our work and all the work of the experiment stations, and when that man gets back to Washington, he has seen every experiment station in the Federal Union. Moreover, the Secretary of Agriculture visited us last June. He himself is an expert in cattle feeding, but he was wonderfully impressed with what we had done and by the reports of the Government Inspector, and by what he saw himself. They have passed by Minnesota, Wisconsin, Iowa, Illinois, Nebraska, and all the other stations of the country and have begun at Columbia, at the expense of the United States government and in co-operation with our station the largest experiment in cattle feeding that the United States government has ever undertaken and also the largest ever undertaken publicly or privately, in an experimental way, in the United States. I leave you to judge if the government could have found a station that they thought better able to do this work, whether the government would not have chosen that station.

In this connection I want to tell you not only some of our good things but also some of our deficiencies. I want to tell you frankly. I should hate very much to leave here feeling that I had exaggerated a single thing in your hearing. Not only am I prone to tell the truth, but if I were not prone, I think it is by far the best policy. We are not equipped with herds and show material in animal husbandry as we ought to be. The University has been spending a great deal of money in fitting its laboratories assigned to this work, but laboratories, however expensive they may be, do not make much impression on the average stock breeder. However inexpensive his own farm may be, when he comes to Columbia he wants to see fine herds, and he will not find very fine herds of cattle at Columbia yet a while. That is not due to the fact that we do not think fine herds are necessary, but it is due to the fact that with the money we have at our command we cannot provide everything in a day. You cannot equip your laboratories for scientific work in a veterinary surgery and in dairying and animal husbandry and at the same time buy large and expensive representative herds in cattle, sheep and hogs. It takes an immense amount of money to do that. We have not money enough yet to do it all. We have put our laboratories in order and we are asking our legislature for an appropriation for herds of improved live stock, cattle, sheep and hogs, and as my boys say, "It is now up to the Missouri Legislature" whether they will provide it or not. I believe that they will do so, and that the man who comes to Columbia next fall will find the herds of livestock there very fine. We have some good animals. I believe we have as good Jerseys as you can find in the State, but as for some breeds of cattle and the principal breeds of hogs and sheep, in some instances we have no herds at all and in some instances we have very small herds, in fact entirely too small, and Professor Mumford in his work in stock judging is seriously handicapped by the fact that we have no fine herds of improved live stock. In some instances where the quality is all right, the herds are entirely too small. We have asked the Legislature to remedy that at the coming session by an appropriation, and if the Legislature grants it, as we are asking them to do, we assure you of improved herds just as soon as the money can be invested.

The College of Agriculture is getting ready to do some very fine work in dairy husbandry—that interest appeals to you here about Springfeld, for if you don't know it, I do know that some of the best dairy sections of Missouri are in the Southwestern part of the State. The last

Legislature made an appropriation of five thousand dollars for the employment of a staff of workers in dairy husbandry and for the equipment for them and for their traveling expenses when they went over the State. The last Legislature put up also a laboratory for dairy husbandry, a fine one. We examined the plan of every laboratory of dairy husbandry in the United States that is worth anything—the best of them at least, and while we have not the largest we really think we have decidedly the best laboratory of dairy husbandry that has ever been constructed by any college in this country.

With that I dismiss horticulture and animal husbandry and dairy husbandry, and I will talk to you briefly, for I must not take too much time about what the College of Agriculture has done for education and chiefly what it has done for education through the University. I presume that it will strike all of you as true that the College of Agriculture exercises more influence upon the State University than it does upon any other educational institution of Missouri, and I presume that those of you who are acquainted with the facts will not undertake for a second to question the statement that the State University is exercising a more powerful influence upon education in this State than any other institution. The College of Agriculture is having indirectly and chiefly through the University a very great influence upon general education; and although this fact is so very patent to me, it is surprising how few teachers and educators appreciate it. I sometimes meet my friends from the denominational colleges of this State—and there are some excellent denominational colleges in this State and one of them in this city—and they begin to joke me about my College of Agriculture. Surprising as it may seem, these gentlemen rather seem to think that the University holds on to the College of Agriculture for the amount of money that is in it and they rather seem to think that I am going to bow my head and feel just a little bit ashamed of having a College of Agriculture in the University. Gentlemen, I speak the truth when I say that there is nothing in that State University of which I am in my heart prouder and for which I am more grateful to God than for the fact that it contains a College of Agriculture, and in my heart I am sorry for every State university that is cursed by the fact that it has not a college of agriculture, and if every denominational college in this State could put a first class College of Agriculture on its campus, it would surround itself with blessings that very few of them dream of.

President Jordan, of the Leland Stanford University, while not at all infallible, is one of the ablest college presidents in America, but he has no college of agriculture attached to the Leland Stanford University, none at all, presumably, therefore he is a fair witness in the matter, he certainly has no college of agriculture to color his views in favor of that institution. He paid me a visit last week and while he was there in the space of about thirty hours—thirty to forty hours, because I went to St. Louis with him—on the train he said to me not less than a half dozen tiems—the thing seemed to be on his mind—he said to me again and again at intervals between remarks: "The great institutions of learning in this country are going to be a few heavily endowed private institutions and those state universities which have in them colleges of agriculture." He said, "they are going to be Harvard, Columbia, Stanford, Chicago and some others"—I won't finish his enumeration because it was not very long and he did not include some glorious names—"and the State Universities of California" (that is his greatest rival) "Minnesota, Missouri, Illinois, Nebraska and Ohio, those are the institutions that have a great future before them, and those state universities," said he, "in which the college of agriculture is separated from the university will be compelled in a few years to take sècond rank." Now, Mr. Jordan is not infallible—I will remind you of that again, and Mr. Jesse is not any more infallible than Mr. Jordan, but I believe firmly in the truth of his statement, so far as state universities are concerned, those are going to distance the others that have in them a college of agriculture and mechanic arts, and I would not lose that college and the influence which it exerts—the beneficent influence which it exerts upon the University for any consideration which I could name to you here.

The people do not begin to know what these colleges of agriculture involve—they do not understand them at all, and the farmers understand them generally about as well as many so-called educators. I want to talk to you about the Hatch Act, which ought to be dear to every Missourian, because the author of that act was William H. Hatch who represented in Congress for many years, the first district of Missouri, and that celebrated Hatch Act is named for the Missourian who introduced it in Congress and fought it through the House. That act endows research. It has set the seal of the Federal Government—the great seal—to the doctrine that public money belonging to the people can be legitimately used for purposes of pure research, and almost every state in the Federal Union by making appropriations to the Hatch Act has set the seal of the commonwealth to the doctrine that public money can be used for pure research in agriculture. Now that people are quibbling on your street corners and at your cross roads as to whether public money can be used for the education of children, I want to point to the fact that the Federal Government first, and almost every state in the Union has set its seal to the truth of this doctrine that public money belonging to the people may be used legitimately for purposes of pure research. I want to ask you why that research is in any wise confined to agriculture? What prevents the Government or the State from using public money for research in hygiene? If public money can be used for research in agriculture it can be used for research in commerce, in manufacture, it can be used for research in any direction. The Government while confining the research to agriculture only has committed itself to the doctrine that public money can be used for research in any direction that is profitable enough to the people. Many of your wise men are quibbling on the streets—I fear some in Springfield—I am glad if it is not so in Springfield—but some men in Columbia, at least, are quibbling on the subject of whether public money can be used for the education of children—whether it is right to take my money when I have no children to educate, to educate your children, just because you have children and I have money, and some people do not think that public money can be used legitimately in that way. Some think it can be used legitimately for taking in a little learning, but not very much, it cannot be used for the high school nor for the University legitimately. What has the Federal Government declared? That public money can be used in carrying on research in agriculture or research of useful information in agriculture to the people in any way in which it can be gotten there. So far from confining it to the children, the Federal Government has endorsed the doctrine that useful information can be carried to the people at their homes, whether young or old, and when people in this State are questioning whether it is right to have a State University at Columbia and to graduate young men on the Campus, the United States Government under the leadership of Mr. Hatch has taken the very advanced position that it is right to carry to the people from the cradle to the grave useful information at their homes, by publication of newspaper reports and by lectures or any other method which you choose to employ. If this can be done for agriculture, it can also be done for manufactures, it can also be done for commerce. It has not been done yet a while, but if it is right under the theory of our Government to take useful information to the people of the State at their homes, with the aid of public money about agriculture, why not about commerce, about manufactures, about public health and why not about any useful thing? And does it not seem to you that the Government has taken this position that the education of the people from the cradle to the grave is a function of the State? That it is the business of the State to educate young or old in schools because it is the most effectual way, but also to educate the full grown who cannot leave their homes, at their homes, and it almost surpasses my comprehension why people should feel it incumbent upon the State to educate the children who constitute the citizenship of tomorrow and refuse to educate the full grown people who constitute the citizenship of today. It has always surpassed my comprehension why it was right to spend public money on the education of people assembled in a school and yet it should be wrong to spend public money on the education of people, so far as it could be accomplished, at their homes. I believe as firmly as I believe that I am standing here that sooner or later the people of this country are going to come to this conclusion that it is the function of the State to educate its people as well as its function to rule them, and that no limit can be placed upon the process of education, so long as it is effectual; that it must be given to the people irrespective of age and irrespective of residence and I think that we are coming to the doctrine that the Government owes this to the people because of the preciousness of the individual soul. Our forefathers reasoned that the state ought to educate for the preservation of the state, but we are going to reach the doctrine, sooner or later that the state must educate because of the preciousness of the individual soul, and that no limit of age can be placed upon the process, but those who can be assembled together shall be educated in masses, because the process is the most effectual in that way, but that those who through circumstances are debarred from attending schools and institutions of higher learning shall receive at their homes such instruction as the state can give in that handicraft, instruction through traveling lecturers, traveling libraaries, traveling galleries and instruction through publications. What is the State of Missouri doing now? Does not the State hold a large number of institutes every year conducted by the State Board of Agriculture? Does it not sustain a secretary of that Board on a salary, and what is the purpose of these institutes except to go around among the people and give them such information and education as can be carried to them in the neighborhood of their homes? What does the Federal Government do except to give our Station at Columbia the franking privilege in order that, without paying one single cent for postage we may scatter thousands and hundreds of thousands of documents among the farmers of the state respecting agriculture, documents that they should read at their homes? Our publications from the College of Agriculture do not fall short of two hundred thousand documents per annum, and every single one is sent out under the frank of the Government, without the payment of a single cent of postage and the Government smiles blandly every time we send them out. If that can be done for agriculture, why may it not be done in every other line of work and Mr. Hatch has advanced the doctrine that it is the function of the State and Government to educate as well as control and that you cannot limit it to children but must extend it to grown people as well; that you cannot limit it to those who congregate in institutions of learning, though that is the best way to do it, but you must also carry it as far as possible out to the people that cannot attend these institutions.

Lastly, and with this remark I close, the College of Agriculture helps to keep the University down from too lofty a perch in regard to learning. The old-time notion of a college was that it was a severed, isolated institution, set apart and enclosed behind a fence where people became very learned and very high toned, and God forbid that the time should ever come when the college does not stand for learning in its highest form and for the highest merit. But the old-fashioned college was not concerning itself at all with taking the knowledge down to the pursuits of man. The College of Agriculture at Columbia has taught me this doctrine which is fundamental in my administration of the University, that every professor in that institution has four lines of service: First, to teach, second, by precept and example to mould life on the campus and in the student and in the institution, third, to conduct research into the region of the unknown and publish the result, and lastly to maintain a line of public service. Every chair should reach the men outside of the University and some large interests outside. Now it is very difficult to say exactly how certain chairs are going to render any large public service, and I want to confess the difficulties of that doctrine. I have not quite made out how the chairs of foreign languages can render any public service, nor have I found out how that glorious chair of philosophy—which I think ought to be great in every institution—how it can render much public service; but with these exceptions every single one of the fifty chairs at this institution at Columbia has a line of public service which it can render. They are not all doing it today, to tell the truth, but if I live I am going to get them into some form of public service; but every chair in the College of Agriculture has some line of public service which it is rendering splendidly to the people of this commonwealth. I do not see why the Chair of Political Economy should not attack the problem of taxation and lend its assistance to all the problems which attend taxation, and something needs to be done in that direction. I do not see why the department of History cannot interest itself in the history of Missouri, which is one of the richest histories that any state in the Union has. Why should it not write a history on banking in Missouri and there is no state where it is more instructive than in this Commonwealth.

The Department of Chemistry is rendering notable service in this state. Every fertilizer offered for sale in this Commonwealth has been analyzed in our laboratory, and if the manufacturing firm cannot secure the endorsement of our laboratory as to the purity of the article which they are manufacturing, it cannot be put on sale in this Commonwealth, they have to go to some other state to sell it. I see no reason why we should not have a pure food and drug law in this State and all the analyses conducted by the Chemist of the University.

Our Chair of Geology has just rendered this little piece of public service: The Professors of Geology, Civil Engineering and Chemistry have been combining for over a year to find out to what extent cement rock exists in Missouri. It is hard to do. First, you have to find the rock that will produce cement then you have to take it to the laboratory where it has to be carefully ground, then dusted and sifted and mixed with a certain proportion of other things and then tested under pressing machines and you do not always get it tested exactly right nor all the other ingredients mixed in exactly right proportions so that after probably a dozen experiments you may find at last that you have not succeeded. We have found good cement from Hannibal down to St. Louis and we found that Kansas City has under it an almost inexhaustible supply of the fine Portland cement rock which needs only to be taken out and crushed. A bulletin will be published in a few weeks that covers the line of public service that that chair has done for this State. Our Chair of Electrical Engineering has measured all the water power of this State. The Geologist has found where the coal beds lie and the thickness of the veins and no man had measured the power of the varieties of Missouri coal to produce steam in comparison with corresponding varieties of other states until it was done by our Chair of Mechanical Engineering recently and the results were published in a bulletin.

And so I can go over the entire University and after taking out half a dozen chairs, there is not a chair left in the Institution, out of about fifty that cannot, if it will, render to the state, first to teach, second to influence the students and institutions at home, third, research into the unknown and fourth and last, but not least, public service and I will tell you plainly that the University is aiming to render to this State as great service as it possibly can. I believe that what we have done in the last seven years in agriculture is saving the citizens in this State ten times what the State has put into this College of Agriculture and I hope to see the University concerned in every large interest in Missouri, provided it can be reached on a scientific scale.

A STUDENT'S OPINION OF THE MISSOURI AGRICULTURE COLLEGE.

(By J. M. Doughty, Farmington, Mo.)

Napoleon said, "Energy, system and perseverance are necessary for success." These three and three others are necessary for success in agriculture. The other three things which I consider essential for successful farming are, thought, observation and knowledge. So the six essentials are energy, system, thought, observation, a knowledge of the principles underlying agriculture and perseverance. Energy is possessed by nearly all farmers, and very few men go on the farm because they think farming a "snap." While most of the farmers have energy, many are lacking in system, but system is something that can be acquired and is essential for the highest success. The farmer may eke out an existence without much thought but there is probably no one who is paid better for thinking than is the agriculturist. Observation is very important because it teaches the farmer of the success and the failures of others. Surely everyone considers a knowledge of the principles underlying agriculture essential for the tiller of the soil. Having the other five requisites the farmer should be persevering, as success in his profession is not attained in a few days.

Considering the young Missouri farmer to have energy and perseverance, where can he best get the other requisites of success? Certainly at the Missouri Agricultural College. The student of agriculture is continually learning system from its being taught and from a study of the sciences in the course. It must be remembered that the agricultural course is a combination of sciences, and science is classified knowledge. I believe that no one can graduate from the Missouri Agricultural College without having a deep impression of the importance of system. While our course may not be as good as some others to train thinkers it certainly is toward the front along this line. No one can take lectures under our enthusiastic professors and make a passing grade in our laboratories without doing a great deal of thinking. When it comes to observation I think our course is far ahead of any course in the University. The study of language is not to be compared to it. For example, I was told by a student of one of the leading colleges in this state that the Professor of Greek of that institution went out one morning to milk his cow but could not find her. There was a cow in the lot, but she did not belong to him. The professor walked all over the town hunting the stray animal but finally became discouraged and started home. On the way he met a neighbor and asked him if he had seen the cow. The neighbor replied, "Professor, your cow was in your lot when I left home." The professor said there was a cow in the lot but she did not belong to him. On reaching home he walked upon the right side of the strange animal and recognized her as his own. That morning was the first time he had ever seen the left side of the cow although he had been milking her for several years. I can assure you that at the Missouri Agricultural College we learn to look at both sides of a cow; to watch the rocks crumble into soil; to study the rooting, branching and flowering systems of plants; to study the habits of insects. In fact the student has his power of observation so trained that he learns something from nearly everyone he meets or from nearly everything he sees. As he rides through a district he can see the mistakes of others and profit thereby, and he can also get many valuable points in agriculture. Observation is not only profitable but furnishes a great deal of pleasure, and country life need not be dull to any one who is a close observer of nature.

The next thing to consider is the knowledge of the principles of agriculture. It is very important for the farmer to understand the natural laws which govern agriculture and these are taught well at the Missouri University. In agronomy the student is taught how to cultivate the soil so as to save moisture and how to maintain the fertility of the land, and also many other things that relate to soils and crops. The student, in the shops, learns to use carpenter's and blacksmith's tools, and in drawing he learns the use of drawing instruments. In dairying he takes up the testing and handling of milk and cream and the making of butter and cheese. In horticulture the student is taught the propagation of plants and the locating, cultivating and care of orchards. Stock breeding and animal husbandry explains themselves. Stock feeding treats of the composition and digestibility of foods, and of their comparative value and of the computing of rations. In entomology the student is taught the habits and names of the most important insects, and the methods of destroying those that are injurious. Agricultural Engineering treats of the farm drainage, of the construction of farm buildings, etc. Agricultural Chemistry shows the relation of chemistry to agriculture. In veterinary work a short course in comparative anatomy is given which is followed by clinical work and lectures on the treatment of diseases of domestic animals. Botany, Physics, Chemistry, Geology and English are the same as given to the students of other courses.

In addition to the work named the student must take advanced work in some of these subjects and also take some work in some of the other departments of the University. I believe that all students that complete the four years' course in agriculture think their time well spent. Many cannot take the long course and for these short courses have been arranged. One of these courses is in horticulture, one in soils and crops, another in dairying, and still another in animal husbandry. The short courses last twelve weeks and during this time the student spends six days a week in attending lectures and working in laboratories and in the orchard. During the last three years I have been acquainted with many of the short course students and I have never found one yet but what was well pleased with the course. There are also summer courses in agriculture and horticulture which are said to be very popular with the summer course students.

The farmer must help the agricultural college if it is to do the most for the people and how can he do this? First, by getting interested in progressive agriculture himself and then by talking to the young people of his community and get them enthusiastic over farming. Tell them that Sir John Lubbock said, "Ignorance costs more than education." Also tell them that Uncle John Patterson, in talking from long experience, said, "Increased profits in farming come with increased knowledge." Having done this persuade them to come to the Missouri Agricultural College. They need not be wealthy to attend the state's great school. Nearly all the graduates of the agricultural college, since I have known anything of the school, have worked their way through. If a fellow comes to the Missouri University and wants to work his way through, the professors and the Young Men's Christian Association will see that he gets a chance.

Next the farmer should demand of the State Legislature appropriations large enough to place the Missouri Agricultural college ahead of any in America. To do this the college farm must be better equipped with cattle for the teaching of animal husbandry. The Iowa Agricultural college has $55,000 in fancy cattle, hogs and sheep, while Missouri has only $5,000. The Missouri Live Stock Association should strive to place our college ahead of Iowa.

I think this Association should do everything in its power to get an appropriation from the state for money to buy finished cattle for the Agricultural college. We have a strong man in that course, but we have not sufficient cattle to work with and I think this association could get that appropriation if they would only work like the Dairy Association worked. Two years ago the Dairy Association asked the Missouri Legislature for thirty thousand dollars for a dairy building and five thousand dollars for a chair of Dairy Husbandry and the bill passed without any trouble. President Jesse, in speaking of the Dairy Association a few weeks ago said that he only wished that he could have the Dairy Association back of every request he made to the State Legislature. It looks to me like this association could have a great deal more influence with the State Legislature than the Dairy Association, because the live stock interests of the State of Missouri are certainly far ahead of the dairy interests and I am sure that if this association would only go to work with the same zeal that the Dairy Association has shown, our Agricultural College will be far ahead of Iowa, Illinois or that of any other State in the Mississippi Valley.

PROFITABLE CLASSES OF CATTLE FOR THE FARMER TO RAISE.

(By Hugh G. VanPelt, Ames, Iowa.)

Not a great many years ago it would have been an easy matter to decide which classes of cattle could be raised on a farm with profit. Land, labor and feed could then be commanded at a low figure. The land in those days could be farmed at a profit with no stock at all, save horses to do the work. Since that time conditions have been changing until at the present time we find good farms ranging in value from $40.00 to $100.00 per acre. Where such conditions exist great care must be taken to restore the fertility which is taken from the farm in enormous amounts with each crop. The welfare and prosperity of every agricultural state is, in a fundamental sense, determined by the productiveness of her soil. If the hay and grain are removed from the farm in their raw state the farmer finds that it is only the course of a few years until the yielding value of his farm is lessened in a great degree. To resort to commercial fertilizers is a great expense added to the already costly operation in raising grain. Some grain farmers have resorted to the rotation of crops as a means of retaining the yielding value of their land, but, nevertheless, where a crop is taken away each year with nothing returned, it is only a course of time until the farm crops begin to return smaller yields.

The question finally answers itself. That the only way to retain fertility of the farm, is to feed the crop to stock and return the greater part of the plant food to the land in the form of manure. But to do this the farmer must determine how it can be profitably done and this leads to the subject, "Profitable classes of cattle for the farmer to raise." There are three classes of cattle which must be considered under this subject.

In dairying districts, where properly handled, the dairy cow is a very profitable investment; the farmer sending the cream or butter to market, keeping the skim milk and buttermilk at home to feed to the calves and hogs. Then there is the dual purpose-cow, of which we have seen so much in the columns of our leading stock papers lately, and many farmers there are in the states of Iowa, Illinois, Minnesota and Wisconsin, who have resorted to this class of cattle with the feasible excuse that land is so valuable that they cannot afford to keep a cow a year to raise a calf; and many professors of the agricultural colleges in those states advocate that this is truly the profitable class of cattle for the farmer to raise. But both dairy and dual purpose cattle are at the great disadvantage of causing a great deal more labor and care to the farmers in milking, caring for the milk and raising the calves by hand, thus reducing the number of cows for which one man can care.

In this state, blessed as it is with short winters, and, blessed as it is with being able to produce large crops of corn and alfalfa and last, but not least, having the blessing of being one of the great grazing states in the Union, it seems there is no other class of cattle which can so profitably be raised as the beef breed. But, this class can be divided up into three sub-classes; the scrub, which is, and should be, rapidly going out of existence; the high-grade and the pure bred. Missouri is in the lead with the latter. At the greatest shows in this country Missouri is always represented with the best herds of Herefords, the best herds of Short-Horns, and until late years, with the best herds of Angus, not only to be shown, but to show.

All farmers, however, cannot be breeders of pure bred cattle, but as heretofore there is still room for improvement by grading up the female side of the herd with the use of pure bred sires, by careful selection of the superior and a continual culling out of the inferior matrons.

What grand results can be obtained, by the use of pure bred sires is plainly seen when we consider the range steer of the past with long legs supporting a poor, lean, lank body adorned with horns three feet long on one end and a coarse tail dragging the ground on the other; living on the ranch eight years before going to market. Compare him with the range steer of today after the use of pure bred sires for a few years. They even outclass the average of our native stockers, being saleable as calves and yearlings, with short legs supporting a broad, deep and smooth body, thickly covered with a high quality of flesh, a mellow hide and a long, mossy coat; all put there by the use of good blood. Such an example should be used by every farmer as an object lesson in raising cattle on the farm and care should be taken in selecting sires, such that when mated with the cow on the farm would produce calves that are low, broad, deep, smooth and even with parallel lines.

By being low, we mean, the property of the standing on short legs and with this property comes depth throughout, giving a formation to the steer of being blocky or rectangular in shape. Such a steer is usually broad in proportion, adding to the breadth of loin, spring and depth of rib, which points, constitute the two highest priced cuts of the steer, valued from the butcher's standpoint. By parallel lines we not only mean a straight top and underline, but the width of the shoulders must be carried in a straight line out to the tailhead, giving a smooth appearance instead of being roughened, as in the case where the shoulder is wedge-shaped and the hip bones projecting out like a hat-rack, cutting in behind them to a patchy tailhead. The straightness of the underline is in direct relation to the depth at which the back portion of the thigh extends downward. Not one of you gentlemen can call to mind an animal whose back thigh cut off too high up that was not tucked up in flank. With all of these lines parallel the large heart girth is also insured. However, with all of these points considered, the breeder has obtained the form only, of the profitable animal. He must now look to the quality and character of the animal, which so quickly captivates the eye of the buyer when the product is ready for market. These two essential points can be determined, only by indication. A good feeding animal should have a soft, mellow, medium thick hide, covered with a dense, mossy coat, as the outer indications are in direct relation to the inner vital organs of circulation and digestion. If the coat is harsh and wiry or the hide thick, coarse and unyielding to the touch, then the blood circulation is sluggish and the digestive organs are lacking in strength. The head should be broad between a pair of prominent, yet placid eyes, then short from this portion of the head to the nose; large nostrils are indicative of a rugged constitution and a large mouth is always to be desired. Although these points are simply indications, a steer which does not possess them will always be found lacking in the feed lot and when sent to market. Good, firm bone is desired, but this does not mean a great coarse bone. Coarse boned animals are invariably rough animals, and such never feed out in a smooth, finished condition. To sum up, then, the animal for which we must strive to raise is one good in these points with no tendency toward the wedge-shape, one of good, firm quality, showing plenty of character and style. Many may say we cannot eat character and style, but yet, to have a smooth, deeply fleshed steer, these points are found to be essential.

In breeding such animals we do so to please the butcher, who sets the price on our product when it is finished and goes to market. What he wants is best exemplified by the price which the wholesale dealer sells the different cuts to the retailer. From a good carcass of a 1750 pound steer, dressing 1,022 pounds of edible meat, the loin, which is the choicest portion of the carcass, weighs 183 pounds and sells for 19 cents per pound. Next in value is the rib, weighing 113 pounds, selling at 16¼ cents per pound; the round, weighing 241 pounds, sells at 6 cents per pound; the plate, weighing 162 pounds, sells for 3¼ cents per pound; the shank, weighing 58 pounds, sells for 2½ cents per pound, while the cheapest portion, the flank, weighing 34 pounds, sells for 2 cents per pound, or, in other words, the ribs and loins of a good carcass of beef constitute only 28 per cent. of the carcass, yet, they sell for nearly 64 per cent. of the entire value.

Considering this, can we wonder at the butchers bearing so much stress on the breadth, depth and thickness of covering of the loin and rib, and can we not plainly see which is the profitable class of cattle to raise from the butcher's standpoint? The last consideration, but by no means the least, is that the farmer must look for that class of cattle which not only fills the butcher's requirement, but that class which, when placed on grass or in the feed lot, will mature at an early age in a smooth, firm and well ripened condition.

To quote Mr. John Gosling; the method of gaining this end is best shown: "In grading up the herd the breeder should have one aim in view; that of producing an animal that will mature at an early age, yet being heavy in the high-priced cuts, requiring less feed and time to prepare them for market. Intense breeding tends to produce an animal which fattens rapidly and the great mistake many feeders are making in feeding this better class of cattle is that they feed them too long, fattening them too highly to be profitable to the feeder or to produce the best quality of beef for the butchers. This is one lesson the feeder must learn; when to turn off his cattle at the right time, replacing them with another bunch, thus finishing three bunches of cattle in the same time that it took to finish two bunches where cattle were of the poorer grade."

At the Iowa Experiment Station it was proven that a highly bred steer did not make a larger gain in the same period of time and on the same amount of feed than a scrub steer, but that the better bred steer finished up into a much smoother product, being a great deal stronger in the more valuable portions. The experiment was conducted with a high grade Herford and a high grade Jersey streer. While in the feed lot both steers put on gains at nearly the same rate and cost per pound, yet, when sent to market the Hereford steer sold for ten cents per hundred above the top prices of any cattle on the market that day, while the Jersey steer sold for $2.12½ per hundred below the top quotations, making a total difference of $2.22½ per cwt. in the two steers. To cite the reason for this difference in price they were followed to the block. The Jersey had 190 pounds of internal tallow and 55 pounds of suet on a 763 pound carcass, or 32.1 per cent. of the carcass was tallow, which was worth at that time 4 cents per pound, while the loins were worth 19 cents per pound at wholesale. This steer dressed but 57.5 per cent. of beef, while the Hereford steer dressed out 67.5 per cent. The Hereford had only 95 pounds of tallow and 38 pounds of suet on an 888 pound carcass, or 15 per cent., as against 32.1 per cent. for the Jersey.

Thus, we see what good beef blood does for the farmer when placed in the feed lot against the scrub and that there is only one profitable class of cattle for the farmer who wishes to raise beef; this class being the steer which has been brought as nearly as possible to perfection by the use of good blood.

THE MODERN FARM COW.

(By W. P. Harned, Vermont, Mo.)

We would like that the basis of our article be that the greatest type of cow is the one that does the greatest service to the greatest number of mankind. This rule is even true of man; the greatest personage is the one that does the greatest service to the greatest number.

DOUBLE MARY 6TH AT 13 MOS.
Breeders Gazette

Double Mary. A Shorthorn Cow, belonging to W. P. Harned, that has made a reputation as a dual purpose cow.

There can be no universal cow, neither can there be a universal horse, nor even a universal man. What we wish to mean by universal is the highest type of excellence in many lines. They are not combined in one animal; good qualities can be combined but not the highest point in all. To explain further, a horse can not be the best draft horse, the best at speed, and the best saddler combined.

There can be an all round man, an all purpose horse, a dual purpose cow. As illustrating this you can call to mind individuals who are very apt in one line and very weak in others. Also those that are very successful in all lines or as you may express it can turn a hand to anything.

The typical draft horse of today bred to the enormous weight of a ton is a special purpose animal—he can draw immense loads, but with this one purpose his usefulness ends. He has his place but it is not on the small farm where one team must haul the wood, draw the plow, take the family to church, tend the garden, and be the saddler. He can be fair at all even if not remarkably superior in any particular line. The breed war is over. No reasonable champion of one breed is spending his force tearing down another breed. Nobly they have combined against the common enemy to mankind, the curse to live stock husbandry, the living disgrace to any American farm, large or small, this common foe is the scrub sire. He is the hated thing. He is the universal curse. He is the fostered enemy. Against him and him only, all improved breeds are waging a combined war. Until he is entirely exterminated the war should continue, yet we are glad to realize no improved breed is at war with another improved breed. We have the special purpose breeds and it is well. We need them.

There are conditions in which the highest possible attainment in one particular line serves best the purpose.

The heavy dray wagons in our large cities require little else than the ability to draw immense loads. There may be conditions in which the greatest possible supply of butter only is required. It must also be admitted that there are conditions, as on the western plains, where immense herds of cattle are kept for beef only, that the highest possible attainment at the beef making tendency is the prime and almost only requirement. But this is not the condition that confronts the common farmer or as we would have it the average farmer. It is not the condition of a large majority of farms today. The requirements of the ranchman and those of the small farmer are greatly in contrast. The ideal ranch cow is as much beef as possible with barely enough milk to produce reasonable growth in the calf. She requires a robust nature, firm bone and frame, good size and an iron constitution. To these qualities the modern small farm would add as much of the dairy qualities as can be combined till we have the ideal dual purpose cow. She is the cow of our forefathers and I would predict in the east and middle west she is the coming cow. We still at this day have such a cow, but there has been of late years a great impetus for beef and her double purpose has been neglected. The quality is only latent and can be revived with an effort. The American farm needs her. There is a call for the dual purpose cow. There should be some encouragement in financial returns.

It might be remembered that the highest cow ever sold was of the family of shorthorns which combined beef and milk to the highest degree yet attained. The International at Chicago offered a large prize this year for the farmers' cow. The dual habit still exists and the cow can be had but her name is not legion. A hundred years ago she was queen of all domestic animals, and history repeats itself and it repeats oftener than every hundred years. Unto man's care the Creator left all domestic animals and of all these the cow is queen and the bull is the king. Her care is no mean vocation and her study is elevating. The science of reproduction is as deep a science as that of the planets and the laws of heredity are mysterious. She is a commodity and as other commodities may have ups and downs, but every year the well bred cow attaches herself closely to advanced civilization. I have not even named my favorite breed but she must be of good scale and a good udder and should have good hair and we are on a safe road to improvement.

Reflect for one moment how important is the American cow to the American people. A recent authority stated that if the cow trade could drop out, the railings on the railroads west of Lincoln, Nebraska, would be covered with rust. Take away the cow from Chicago and the Union stock yards would half decay and grass would grow in the streets.

Take away the cow from the two metropolitan cities of our own State, Kansas City on the west and St. Louis on the east, and in the stock yards district, the birds would build nests in the weeds that would grow at the parlor window. Here in Springfield if the cow and her products could be withdrawn one year, one would stand on the street and wonder what was the matter. Under certain conditions the special dairy cow is the most desired. Under other conditions the exclusive beef animal may best answer the purpose. But there are conditions in which the dual purpose animal far better serves the purpose and these conditions are more than the other two combined. It is a pitiful sight to see on a farm a fine massive cow covered with a wealth of flesh of 1700 pounds followed by a calf almost starved for milk. I have seen high class breeding herds with nearly as many nurse cows as breeding cows.

Extra conditions may support this but the normal condition and the small farmer cannot maintain them.

ENVIRONMENT AND HEREDITY, TWO GREAT FACTORS IN CATTLE BREEDING.

(By Benton Gabbert, Dearborn, Mo.)

These two great factors cover the entire field, not only in cattle, but in all plant and animal life, including the human family as well. Heredity is the transmitting of traits, both good and bad, from ancestors. This is the great law of nature. In fact, outside of collected data and personal knowledge, it is as self evident a fact as two and two make four, for from whence or where could the offspring derive its individuality if not from its progenitors? And this law of heredity is retroactive, not the first parents giving all, but the power of transmission, running back in some instances to remote ancestors.

COLUMBUS 33º 112109

Columbus 33rd. One of Mr. Gabbert's Herd Bulls.

Take a tabulated pedigree, and you will see that the genealogical tree branches from one trunk to two forks, to four limbs, to eight branches, and on widening, if there is no line breeding, almost indefinitely, and any one of these branches may crop out, and this cropping out, if very pronounced, is called atavism. Just why atavism occurs no one knows. The most probable solution to my thinking, must be some corresponding environment, similar to the remote ancestor's and mating where prepotent blood lines lead back.

In Robinson's "Wild Traits in Domestic Animals," we see the far reaching power of heredity—the pet dog on the hearthrug turns round three or four times before lying down, a trait inherent, coming down from the wild dog, who turned round to break down the tall grass for his bed. In cattle—the cow in pasture or on the range hides her young calf, a trait inherited from the wild cow which fed in lowlands where the herbage was rich and where her cloven hoof enabled her to walk in boggy ground in safety, hid her calf from cruel and hungry foes and grazed with the herd, returning to her calf with full udder and has transmitted to us the milk cow and the mother's instinct to hide her calf. In the horse—the domestic mare in the pasture lets her foal nurse only a little at a time, but often. This is a habit coming from the wild mare, who feeds in the open, ready at any moment at the approach of wolves or wild dogs to take to her heels seeking safety for the colt in flight; to keep her colt in running trim its stomach must not be full, and she allows it but a draw or two at a time, so it can flee by her side. The colts of the fleet and watchful mothers alone survive and breed up a superior race of horses.

Nature in her great law of the survival of the fittest, should teach us a lesson in breeding. The law of heredity, or the old maxim, that like produces like, has built up our pedigrees, a good law to hold to but not infallible. We see the animal, or should, before we trace the pedigree, and if the pedigree is satisfactory, that is the animal for our herd. But with some the pedigree is first, the individual excellence of the animal second. Now the one who chooses from pedigree places too much value on remote ancestry. From my observation and experience, the culmination of heredity should be in the good qualities of the animal you are selecting; the two should go hand in hand, a good animal and a good pedigree, then you have assurance doubly sure that your animal will be prepotent; generally prepotency can be expected only from a union of this kind.

This power of prepotency sometimes ceases with the animal, the offspring are all that you could desire, but the power of transmission does not reach to the third generation. We see this in all breeds and that family drops out of the first ranks soon enough to keep the pedigree crank from spoiling many good herds, but as a general rule the prepotent animal transmits the same qualities to the offspring and they breed on and on, then pedigree becomes a talisman for a good animal.

There is another term or word used in fine breeding that in the breeder's parlance means something very different from what it does to those who are afraid of the devil and to court his favor, call him Old Nick, we drop the familiar and endearing "Old" and simply call it Nick. The term means the dropping off the bad qualities and retaining the good qualities in blending the bloods lines of two distinct families in mating. To illustrate, we take the Grove Third, from whose loins more good Herefords have sprung than any other noted sire, but of the many sons of his who have worn the purple all have had for mothers Spartan cows and had there been no Spartan cows, the Grove herd would have died without wearing the crown as king of Hereford sires.

We now reach a problem in breeding that is a difficult one to solve, one about which our best breeders differ, one which the most successful breeders practice, yet most all breeders condemn. I refer to line breeding or breeding animals of same blood lines so closely blended that some tabulated pedigrees have the same blood lines in most every cross. In starting the pure bred herds of all the breeds, in-breeding was resorted to from necessity in forming a type. Even now it is closely followed by some breeders making a type, so that any good judge can pick out in a large show ring the different breeders' cattle by type. There is much to be said both for and against line breeding.

The best herds have at their head some great sire, with his sons and grandsons in service, in fact, I cannot now recall a noted breeder either at home or abroad who has changed his herd bull every two years, or one who has bought his cows in preference to raising them, that has succeeded in reaching the top or in establishing a distinct type.

Out-crosses generally help the first cross, but subsequent crosses deteriorate. For this rule we have no less authority than Darwin. We think the same rule holds good in breed lines, that is, in crossing families of the same breed; but if these families nick I would seek no farther, but would prefer these two families rather than try a third family. I would term the inter-crossing of these two families line breeding. In-breeding I would define as taking a great sire and breeding in and in with his progeny. This process produces some very superior individuals with a great many not so good.

We condemn this course of line or in-breeding, more from our prohibiting by law such relations in the human family, than from an observance of Nature's teachings. The wild animals in a state of nature necessarily in-breed, yet we have some fine specimens. The wild horse, through the survival of the fittest, keeps the herd in splendid form. The best stallion in their stampedes from wild animals is followed by the fleetest mare: with vicious bite and heels of fire he guards his harem, until the young son, more robust takes his place.

When we consider environment, it is so closely allied to heredity that the proper treatment of a herd makes environment almost the parent of heredity. Were it not so, there could be no progress. The fine herds of to-day owe their superiority to proper handling for generations. It is the selecting and mating of the best, and giving those feeds judiciously that build up a healthy animal, that transmit environment.

Environment can, through necessity, model the form. Darwin tells us that the long neck of the giraffe came by selection through environment. The giraffe is a habitat of Africa, where severe drouths occur every few years. The herbage is burned up and the giraffe feeds upon the leaves of the trees; those with the longest necks alone survive; these in turn meet succeeding drouths, and this gave to the giraffe his elongated neck. I am more and more convinced, from reading and actual observation, that more herds retrograde from being under-fed than from being over-fed. We hear criticisms from our best farm journals against the practice of over-fattening our show animals, yet the fat animal nine times out of ten goes to the front; and I make this assertion and, if you think awhile I believe you will agree with me, that the herds that are most successful at the fairs have for herdsmen the best feeders and fitters. In fact, in the beef breeds we expect fleshing qualities. The general verdict of the ring side is always for the animal in perfect bloom. The feeder's art has been taxed to the utmost to bring the animal to perfection, and if he fails, the fault is lodged against the animal and not the fitter. Between a perfect form in skeleton and rare fleshing qualities with a lack of symmetry, we would always take for a feeding steer the fleshing qualities.

The problem for every one who is a breeder and wishes to better his herd in the selection of a bull is, shall I seek certain blood lines, or look for a sire that as an individual has form and style and fleshing qualities? I would advise the latter course, for if you get the individual wrapped up in a mellow hide, the pedigree of that animal is the epitome of both heredity and environment, and if you treat that bull and his progeny right, your bull may form a family that will make history.

As to definite rules to make a success in breeding they are not laid down in the experience of any man, or in the pages of any book; but there is a rule, the one the old painter gave to his pupil when he was asked how he mixed his colors; the painter replied "with brains"—this remark should be written on the door of every calling in letters of gold, in pictures of silver.

To have the brains to handle properly a fine herd requires the same heredity and environment for men that it does for animals. The best herds in the old country are very old herds. The work is taken up by the son where the father left off, the father's methods are taken in by absorbtion, and later the love of the work and keen rivalry of the breeders, kindles enthusiasm for his life work. Heretofore our best feeders and fitters were bred up, if I may use that term, in the old country. With us, I am sorry to say, many good herds are dispersed because the sons prefer some other calling than their fathers' work. This is due from the fact that the universities over-shadow the less pretentious agricultural college. The states give lavishly of their funds for endowing and equipping their universities but dole out with miserly hand in insufficient dribs to our agricultural colleges.

Heretofore the great highways to advancement and preferment were through the universities; but I believe the day has dawned when the farmers' sons will find that the doors of the agricultural college open up a better field for a high order of talent, and opportunities for advancement in a more remunerative calling than any of the professions. The professions are over-crowded, but not so with the graduates of the agricultural colleges; there are places awaiting them all at living wages. The universities deal with text books and precedents, with paths worn smooth with the feet of ages; and when you have passed through them, you are crammed with obsolete truth and mildewed facts. It takes an original, bright mind to come out of their pedantic walls without old fossilized ideas clinging to his academic skirts, that impede his progress.

But how different with the agricultural college; their professors have not learned it all, they are enthusiastic students themselves, their ears are open to catch the faintest whisper of old Mother Nature, as she yields up grudgingly her secrets; and the charm will brighten as we delve deeper into the problems of animal and plant life. I believe in higher education, and am glad the State is liberal with her University; but between the two, for the advancement of the State in commercial and industrial growth, for the wealth and happiness of her people, I believe the Agricultural College, if properly equipped would prove the greater blessing.

Since writing the above, I clip the following from an address by Mr. Geo. B. Van Norman of the Union Stock Yards, before a Wisconsin institute: "If you will stop and figure, you will see the difference between the 500 pound scrub as compared with the 700 pound grade. The 500 pound scrub is worth 3 cents a pound, which would be $15.00, the 700 pound grade is worth 4½ cents a pound, which would be $31.50, a difference of $16.50 more than the scrub and both the same age. The farmer that raises scrub cattle needs enlightenment, the kind that helps his pockets, helps his family and helps his country. We breeders have been sending out pure bred bulls as missionaries, but if each neighborhood that raises scrub cattle could have one of their farmer boys take a full course at the college and experiment station, he would be a true missionary, waging a war of death to the scrub and preaching the gospel of good blood."

DISCUSSION OF MR. GABBERT'S PAPER.

Mr. Gabbert—I studied a long time whether I would put in that idea. I believe in higher education, I believe in it for the growth of the country, but we are living in an industrial age, in a time when every calling must do some good for the rest of mankind as well as itself. President Jesse's lecture last night presented something to me that I never knew before and that is that the Agricultural College is not only educating the farmer's son, but educating the university. Dr. Jesse has caught that spirit in this industrial age that we must do something that will help the rest of the world along in a financial way. He told you of the different chairs in the University that did something toward helping the world along and of some that were unable to do so; but the Missouri University is a departure from the general rule. I wish to offer some resolutions in regard to our Agricultural College.

Whereas, Missouri is one of the greatest live stock states in the Union, and

Whereas, the live stock equipment and barns at our Agricultural College are wholly inadequate for the purpose of giving the thorough instruction in animal husbandry which the importance of the live stock interests of the State demand; therefore, be it

*Resolved, That the Improved Live Stock Breeders of Missouri, representing all of the live stock interests of the State earnestly recommend the Legislature to appropriate $20,000 for the purchase of pure bred herds of beef cattle, sheep and swine and $10,000 for a barn to accommodate these animals.

I think with Prof. Mumford that they ought to have more money. It seems to me that the College should be the place to go to see better constructed barns than we have on our farms. It does seem to me that a State as large as this and with its resources, an empire within itself, with everything almost that we need to live on, to eat and wear—that we should have an Agricultural College thoroughly adequate. The barn there should be a model barn. The cattle there should be the best, with the best handling and the best development and in years to come it should be the finest herd in the State. Not only that, but the students in that College when they come home should know what a good animal is and learn to discriminate between the qualities of the scrub and pure bred animal. Then indeed they would be missionaries, going all through this country to promulgate the gospel of good blood. But now these boys cannot get the instruction they need, with the few animals that they have in the barns now.

If the Legislature is niggardly and there is no available way to get the fund, we will have to ask for a moderate amount, and I think that is a moderate sum; but I would like to see our Agricultural College as well equipped as any of the same kind in the United States and without an equal in the world.

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*Later, the Legislature appropriated $10,000 for a barn and $5,000 for live stock.

Mr. King—I visited Columbia and I had a very enjoyable time. I saw magnificent grounds. I saw substantial and beautiful buildings. I have seen nothing that I remember that has so impressed me as those beautiful columns on the campus. I believe they are all that remain of the old University buildings. I was shown through one of the best arranged libraries I ever saw, with a high-priced man employed to keep that library in apple pie order. They have a wonderful system of double indexing there—I cannot take time to explain it. I was taken through the Art Gallery and I saw perfect reproductions of the finest works of art in the world, casts of Apollo and Venus, etc. I saw a magnificent school building there in process of erection to take care of the Horticultural Department. I saw the plan of the building where they are going to take care of the ladies, and it will be a beautiful building. I was shown what is said to be the best dairy building in the United States, and then I was taken to some barns, gentlemen, that you would not have on your place. I confess to a feeling of shame as a Missourian when I came from those other things, and was then taken past the swine buildings and was taken into them and then went into these sheds. If any of my friends in other states who are interested in institute work, and I have many of them, should come to this State and we should by any chance come to Columbia, I would do all I could to keep them away from these stables.

Now I appreciate the difficulty that the Legislature has in meeting all demands. I appreciate the fact that anybody can see the things I saw and call attention to places where improvements can be made in a great many different lines; but surely, gentlemen, in an agricultural State with a man—I believe I speak conservatively—a man at the head of our College of Agriculture who has no superior in the United States as a feeder of cattle, we ought to have suitable buildings and good herds.

Gentlemen, we must have barns on the State farm that will go with the University buildings, with the buildings of the College of Medicine, with the buildings of the College of Law and with the man that we have there to take charge of the Agricultural College.

We are getting to be enthusiastic in Missouri. The Agricultural College is going to be something regardless of the obstacles with which it contends. It has a will and I think it will find a way. It has not found it very fast, not so fast as it should and it seems like the powers that be, have not been as generous with them in their efforts as the powers in Illinois and Iowa and other states. It ought to be a source of congratulation and satisfaction to us to think what we have done in agriculture, live stock and mining in Missouri in the last decade. You know with what pride you all used to look to Kentucky for the horses and cattle, fine horses and fine cattle, good whisky and pretty women,. I think they have the last two yet, but they are not in it with the first. The reputation of Kentucky has virtually moved to Missouri. I do not think we are aware of the position that we really occupy in the live stock department of the world. Take the Missouri mule, we are first. Take Hereford cattle—while I am not a Hereford man, I am always proud of a good breed. Few men know this, but this is Missouri's history, we have more good Hereford cattle than all the other states combined. I did not know that till the Hereford men told me, but it is absolutely a fact, and the register will show it, that we took every prize in Hereford cattle at Omaha. We took our share of prizes at Chicago, Missouri came out away ahead of any other two or three states and I do not know but that Missouri took more prizes at Chicago than all the other states combined. Take the Berkshire hog in Missouri, and where is there another state that can compare with Missouri for Berkshire hogs? We have a citizen here with us, our prominent Berkshire breeder who took ten first prizes at the Chicago World's Fair and seven other prizes were taken by persons who had purchased these hogs from him. This is a fact. There was one ring of cattle shown there and the first, second, third, fourth and fifth prizes were won by Missouri cattle and there was another ring in which the first, second, third, fourth, sixth and seventh prizes were won by Missouri cattle, all except the fifth and eighth. There were eight prizes given. It is a pity that our officials and the Legislature do not properly appreciate the conditions or consider the position that we occupy.

Take our State Fair. We worked for years to get a State Fair. Fifty thousand dollars was the first appropriation that was made. The first appropriation to the Illinois State Fair was two hundred and fifty thousand dollars. But we worked and hammered away and last year when we ought to have gotten one hundred and fifty thousand dollars we were ashamed and afraid to ask for anything that would be really in line because we were afraid that it would appear that it was so entirely out of line that everything would be rejected. They put us down to the small sum of fifty thousand dollars. That is not in line for Missouri. Missouri today stands first in mules, first in cattle, first in hogs and it is entitled to more consideration than it gets, but if the influence of every county could be brought to bear upon the Legislature, through our representatives, if the farmers would take hold of it and show some interest in the matter, and would intercede with their representatives in the Legislature to make an effort to get appropriations for our State Fairs and for our Agricultural College, why they would just simply get it. But we will never get it unless we want it or show that we want it.

The Agricultural College at Columbia is a thing to be proud of; there is no use talking, we are confronted with progress and if the older men of this generation do not see fit to give any encouragement to the Agricultural College, it is going to live in spite of them. It is on the road to progress and it is going to continue to grow. But still you can cast a good many obstacles in front of it if you see fit to do so; but the rising generation is going to learn and study at the Agricultural College; they are going there to learn and nine-tenths of the young men who go to the Agricultural College go there to study animal husbandry. I am informed that such is the case, but they have no herd of cattle; they can not get an appropriation to buy one. They have a good representative of Jersey cattle, a fine herd in that line, but they have none of the beef breeds, no hogs, no sheep and no barn, in which to feed or show these cattle. These young men need to be educated and I tell you we have lived over the old idea surely that educating a boy necessarily makes a crank out of him. We have outlived that idea that it will make of him a book-farmer and a crank. I know and you know that practical knowledge and scientific knowledge can be combined and it is a benefit.

Mr. Ellis: You will pardon me for saying anything. I did not come here to talk. The Board sent me along to look after the members of the Board that came down here, and see that they got back home, but I want to say a word on this subject because it is closer to my heart than any subject that has been discussed during this meeting.

I suppose every man in this house is either directly or indirectly interested in farming, and do you know, gentlemen, that we have been appropriating several thousand dollars at each session of the Legislature to improve the fish in the creeks of this State and have not appropriated a dollar for the purpose of improving the live stock interests? There was appropriated a few years ago sixteen thousand dollars for the purpose of supporting a fish commission. It was reduced after a while, I think, to six thousand dollars and raised at the last session of the Legislature to twelve thousand dollars. That may be necessary but what is the relative value of the cattle industry of this State compared with the fish industry? How many in this house are interested in a financial sense in the fish industry of the State? And yet we have found money—Mr. King said he appreciated the difficulties the Legislature had in finding money for all demands—yet we found money to develop the fish in our streams—and there is no need of discussing that question at all—we have found money to do that, and the only reason, in my opinion the Legislature has not appropriated money to advance the live stock interests of the State is because the farmers themselves have not asked for it.

Just a word to the small farmer, if there are any small farmers or breeders here—the man with eighty to one hundred and sixty acres of land—what benefit will an appropriation of this kind be to you? You have seen here today and will see in any section of this State that the large and successful breeders are united on this proposition. They have advantages to train and educate their sons that the small farmer cannot have, and yet they favor this proposition. Your son cannot have every advantage on your farm. You have not the herd to give him the instruction which the large breeder has, but you can, without expense to yourself, by the appropriation of this money to the Agricultural College, send your son there and let him spend one, two, three or four years getting practically the advantages that the best breeders are giving their sons.

We do not want to be behind other states. Every man ought to take a local pride in his home, in his home locality, his State and his country. We want to place Missouri at the head of the procession. Our live stock industry is great, but in all our public institutions we want to be ahead of others, if possible.

I want to make this statement and if it is unreasonable, I hope some of these breeders present will correct me. At the National Live Stock Show at Chicago, the prizes won by the Agricultural College of Iowa — the prize won by the champion steer fed by the Agricultural College of Iowa, will be worth more to the breeders of Iowa than their Agricultural College has ever cost them, as an advertising medium for the live stock of the State; and yet they have an equipment that has cost them more than one hundred thousand dollars. Which of you who could put down a dollar and take up two dollars would not do it every time? That is what we are asking for. We have practically three million head of cattle in Missouri. Suppose by some means we could increase the value of these three million head two dollars a head, it would amount to six millions of dollars. The appropriation asked for, thirty thousand dollars, will amount to one dollar for every hundred head of cattle in this State. That appropriation of thirty thousand dollars, indeed an insignificant sum, if we take into consideration the vast resources of the State, amounts to one dollar for every hundred head of cattle in this State and an increase of two dollars per head in the value of our cattle would bring us six million dollars. Well, this appropriation, gentlemen, would assist in the development or in the improvement of the live stock interests of the State, not only cattle—this is rather a cattle breeders' session today—but this argument can be used for all classes of stock. You will see what an insignificant percentage of the improvement it will take to pay the State a hundred per cent on its investment or a thousand per cent.

I wish to make another statement. I have always been an economist. I had the honor to serve my county two terms in the Legislature and I take pride in saying that I always favored judicious economy. I favored the same kind of economy that I favor in my own expenses, my own investments. Now of all the men that you know, business men or farmers, it is not the man who spends the least money that is the best business man, but it is the man who spends his money in a way that brings him the best returns. The theory in this State that we want to get appropriations down to the lowest limit is not the best business policy, but the best business policy is that the money shall be so spent as to bring the State the greatest amount in return for what is spent. That is a fair business proposition. That is what you do in your own private business and that is what the State should do, and I believe that the start has been made here today; and if the men here will consider this matter properly and let the Legislature know what they think about it, I believe we are just as certain to get that appropriation, and I believe that you are just as certain to reap one hundred cents profit for every dollar that you put into it in full value returned as you are to know that the appropriation is made, and I hope to see not only this resolution adopted, but I hope to see the appropriation made.

Prof. Mumford: I hesitate somewhat to say anything on this question for various reasons. But it is a question which I need not say to you I have thought about and worked over more than any other question that has ever come before me. You heard last night about some of the things that the Agricultural College and Experiment Station has been trying to do for the farmers. Some very useful work has been done, and yet unfortunately that the College and Station is hampered. Our progress in the University is judged more by the farm and live stock of our Agricultural College than all the laboratories and the fine museums of classical archaeology that the University possesses. Our greatest influence is lost on account of the fact that we have not the necessary equipment, particularly on the farm, and the live stock.

There is just one other thing that I want to say. The appropriations in Illinois and Iowa have been mentioned. Who do you suppose has been responsible for the appropriations in Illinois and Iowa? Who got these appropriations? The farmers and breeders of the state of Illinois simply took hold of the appropriations and went to the Legislature and said to them: "We want this money for building up the Agricultural College," and the University of Illinois would have been where it was for twenty years, without any equipment, if the farmers had not taken hold of it. The Agricultural College of the State of Missouri will be just as good an institution as the farmers are willing to make it. We can get all the good men in America together and if they are not interested in this work, it will be useless. When the University asks for a law building or a medical building, every lawyer or doctor is behind that petition; but it is a pretty hard matter—notwithstanding the farmers are interested and want to see it done, it is a pretty hard matter to get the farmers organized to ask for it. I am satisfied that there is an opportunity now for the live stock men of this State to secure some recognition and there is no other thing that will be so important for the live stock interests of this State as to have good, representative herds of animals at our Agricultural College. The logical conclusion of the whole course is the use of pure bred animals and the annihilation of the scrub, and if we cannot have good specimens of improved breeds, to focus that instruction, to apply that instruction, then much of our teaching goes for naught.

I am proud, very proud of the fact that at the present time there are more men taking animal husbandry in the Agricultural College—twice as many taking animal husbandry and stock judging than in any other technical department in the Institution, notwithstanding the fact that we have to go to our neighbors—have to take the boys on the train to find animals to judge. We have no beef animals to speak of, nor sheep, nor hogs, but we get the animals to judge by taking the boys on the train to a neighboring farm. That is a waste of time and the boys say: "Why can't we have material here to work on as they do in Iowa, Michigan, Wisconsin or Illinois?"

I am ashamed to tell you this thing. It is nobody's fault unless that of the breeders here today and those not here, but this is a fact. Mr. Ellis has told you that Missouri is the leading State in the development of pure bred live stock today, which is probably true. Notwithstanding that fact, the equipment in pure bred live stock at the Agricultural College is less than seventeen other states in the United States. We are first in the production of pure bred live stock and seventeenth in the equipment of the Agricultural College for instruction in animal husbandry. I leave it to you if, as a matter of State pride, it is not worth while for us to hustle around a little and change that.

We have short courses held every winter at the college. This year we divided the short courses into four and we have now a special course in horticulture, in dairying, in soils and crops, and animal husbandry. Now this year forty students have come to take that work. Thirty of them are taking animal husbandry and stock judging out of the forty. One of these courses gets thirty-four out of the forty students, the course in animal husbandry. They are there, what shall we do with them? I am doing the best I can. I am getting animals in and giving the best course I know how to give, but I cannot possibly give instruction in stock judging unless we have the best animals that can be had, and it is time that Missouri is having them.

Resolution unanimously adopted as read by Mr. Gabbert.

THRIFT THE GREAT ESSENTIAL IN SHEEP FEEDING.

(By Jacob Ziegler, Clinton, Ill.)

In sheep husbandry there is one thing that must be observed and not overlooked, and that is thrift. Thrift means health, gain in quality, quantity and productiveness, hence profit, and profit is what we are after. It should always be the object of the flock master to keep his sheep in a thriving condition. The quality of the wool as well as its quantity and the general productiveness of the flock demand this system. Now the question is, what are the essentials of thrift? I say good feed, water, shelter and close attention of the shepherd. It is the worst possible practice to allow the sheep to fall away in flesh as the grass fails in the autumn. The increasing wool conceals the shrinking carcass much to the disappointment of the careless flock master. Better confine them in the yard than to allow them to ramble about in some field in search of food, which furnishes a little green feed but too light to be of any real value.

For winter fodder there is nothing better than fine early cut clover; cut when in bloom and well cured. Hay from old meadows consisting of a variety of grasses is very good. Sowed or thickly drilled corn for fodder, cut and well shocked in good season, is also splendid feed. Good corn stover is a good and cheap feed. A feed of bright oat straw two or three times a week can be fed to a good advantage, and the leaving of the straw and stalks makes a splendid yard and a good absorbent of the manure. Bright sheaf oats fed once or twice a week in racks is also an excellent feed. It answers for both grain and fodder.

Fresh water is very important to have in the yard. It is a mistaken idea that sheep do not need water. In August and September of 1894 I had 150 ewes with that many lambs in a pasture, and they drank a trough of water every day that held 210 gallons, nearly 1½ gallons average per ewe. They can, however, go longer and do better without water than other stock, but thrive much better with it.

Shelter is very necessary. It is the first necessity in providing for wintering sheep successfully in northern latitude. Fine wool sheep will bear exposure better than any other kind of sheep. For the open fleece of the large mutton breeds parts on the back when wet and admits the water, which completely drenches the animal, so that its abundant fleece is no longer a protection from the cold. Economy in feeding also demands shelter, as not only less feed is required but is better preserved from waste. For they will not eat or drink that which is in any way soiled or out of a dirty trough unless forced to.

For lambs, however, I prefer a closed house with large double doors on the east or south of the building and left open except in storms or rainy weather, then shut them in as they do not crowd themselves in shelter like old sheep, and they do better in a closed shed, however crowded, than in a roomy, stormy out doors.

Lambs should have grain from the time they are ten weeks old till the following spring. A trough can be set with oats in it outside of the pasture, fence, near the watering place with openings in the fence for the lambs to get it. They will then learn to eat by the time they are four months old, at which time they should be weaned. In weaning give them the best green pasture you have and what oats they want to eat and plenty of good water and salt. They should be kept in that way until they are put in winter quarters, then they should have from a half pint to a pint of equal parts of shelled corn and oats per day, owing to the size and breed of the sheep, with all they can eat of good hay.

Stockers will do well fed on good hay alone, but better on a variety with a little grain in stormy weather. A daily ration of one pound of grain with straw stover or any kind of roughness is a very good feed for stockers. Sheep can be fattened on various feeds such as corn, peas, beets, barley, oats, clover and grass, they do well on either. But for winter feeding my best results have been from corn and clover hay, that fattens fast and makes the best of mutton, and when all things are considered is as cheap as any, except green clover, which produces very cheap mutton, but the losses from clover bloat and low price of sheep at that time of year reduce profits in proportion.

I feed two bushels of corn twice a day at regular hours to 100 sheep (I am speaking of the mutton kind, averaging about 100 pounds) and as much clover hay as they will eat up clean, which will be on an average about 200 pounds per day. They will, however, need and eat more at the start, but will decrease in eating hay as the grain ration is increased. Care must be taken in starting them on grain so as not to overfeed them. Feed a bushel twice a day to start on, then lightly increase daily till you get them on full feed. Larger sheep need more and smaller less in proportion to weight. The corn is cut an inch long with a corn cutter and fed in troughs 10 inches wide, 7 inches deep in the clear; 12 to 14 feet long is a nice length, but length may be made to suit fancy. The corn may be fed shelled, but I do not like it that way because they eat it too fast, and some get more than they need, but in cut corn, the eating process is slower, the food is better masticated and there is a better chance for all to get their share.

They should always have free access to fresh water and salt and never be left without it. They drink lots when on dry feed; they don't drink so much at a time, but often. Good, thrifty sheep thus fed will fatten and gain thirty to thirty-five pounds each in seventy-five days, and ought then to go to market for it rarely ever pays to feed them longer. The gain, however, will depend largely upon their condition when put up for feeding. If fairly fat they don't gain as much as if in moderate flesh and thrifty, nor do they require as much feed or as long feeding.

If one has no clover for hay then sow 1½ bushels of oats with 1 bushel of field peas per acre and cut when in dough and cure like hay, It yields big and is a fine substitute for clover hay. Corn fodder does very well but is not as good as either of the former.

Never allow feeding sheep grass in winter as the grass is too light and soft to be of any real value to them, and the losses in searching and rambling after it and the refusal of other feed more than double the supposed gain.

The feed lot should be in a dry place. Have a shed, closed at one side and the ends and roofed over to keep out rain and wind. Both it and the yard should be bedded with corn stalks or litter to prevent mud and wasting of the manure. A timber lot or small grove well set with trees is a good place to feed in. The trees are protection enough without shed, but in a wet winter a shed is far better and the manure can be saved better.

Salt and hay should always be fed under cover—hay in racks and salt in troughs. Economy in feeding demands this system, for water-soaked hay is always rejected by sheep and salt wastes much from rain.

Of course it is understood there are other good feeds to fatten sheep on, such as mill-screenings, oil-meal, etc., and are used by regular feeders who buy both sheep and feed to fatten them in large numbers for speculation, which does not interest us. But what we are interested in is how we farmers and stockmen who raise a part or all of the first-mentioned product on our farms can turn it into meats so we can drive it to market instead of hauling it and realize as much or more for it than it would bring in a raw state, and enrich our soil besides so we can raise more and better grain and stock.

To do this I believe our own raising the most profitable feed. It saves the expense of transportation to and fro. And when thus fed and the manure has been hauled and well distributed over the land it will always retain its fertility and will get better every year instead of worse. From my own experience it pays best to feed it to sheep. They return more pounds of gain for the amount of food consumed than cattle or hogs. Besides, mutton brings more per pound than beef or pork and furnishes better manure than either.

My sheep have gained me from start of feeding to finish 8 to 10 pounds of mutton per bushel of corn, while the gain of my cattle of equal quality and feed runs from 7 to 8 pounds. My hogs eat corn, corn from first to last and only a little grass for change, while my sheep eat grass, grass from first to last and only a little corn to start lambs and to finish them. That is the cheap feed vs. high-priced feed.

I find from my shipping bills, which I have saved for 25 years, from 1873 to 1898, that the average price received for my stock in Chicago during that period was $4.93 per 100 pounds for sheep, $4.86 for steers and $4.85 for hogs, and the average weight was, sheep 126½ pounds, steers, 1,354 pounds, and hogs 218½ pounds. From this you can see they had to be all of good stock to average that weight.

The foregoing facts, obtained from my experience, convince me that sheep are, in general, the most profitable stock on a farm, especially on thin and high land. In conclusion, I will say, keep none but the best of whatever breed you have. They will pay when poor ones lose. Sheep are easy to handle and easy to retain in an inclosure that would not hold other stock, and they are the best weed destroyers on the farm. Taking all things into consideration the sheep certainly has much to commend it to the farmer.

DISCUSSION OF MR. ZIEGLER'S PAPER.

Mr. Ziegler: Last year I had some ewes that I wanted to dispose of. I generally market them along in April or May, and the idea struck me that I would try a new plan. I took the ewes and bred them in July. I had 45 of them and wanted to dispose of them. I bred them in July and was successful in getting in December, fifty lambs. I fed the ewes well on corn, oats and clover hay. I fixed a little space off in the barn for the lambs and gave them bran and corn. I fed them three months and shipped them to Chicago the Monday befor Easter. Those lambs weighed 55 pounds when I sold them in Chicago for twelve cents per pound, or $6.60 apiece, I might say. I knew that the ewes were in good condition, so I kept the ewes and sold them along in May, realizing $5 a hundred for the ewes. This country down here in Southern Missouri strikes me as a good place to raise lambs.

Mr. Maitland: You said in seventy-five days, your sheep made a gain of thirty-five pounds. Can you not make a greater gain with hogs?

Mr. Ziegler: Yes, but it requires more feed. A hog can gain much faster than a sheep, but it takes a great deal more corn. A hog eats corn all of the time and just a little of some other feed, while a sheep eats hay or grass all the time with just a little corn. It takes high priced feed to finish your sheep, but with the hog it takes high priced feed from the word go.

Mr. Maitland: Our hogs run on blue grass all the summer.

Mr. Ziegler: I find that I have to feed grain all the time. If you turn your hogs on blue grass pasture without grain you will not get very much out of them.

——— How is the best way to get rid of the dogs?

Mr. Ziegler: Strychnine is the best thing to use. If you go to shooting the dogs, some of your neighbors will get angry and you will get into trouble, but if any dogs come around your house at night, just try a little grain of strychnine in his feed and the morning, go around and pick it up. Now I do not know about your laws, but in our State you cannot purchase strychnine unless you are a sheep man, if you have not that law, you want to get it.

Mr. King: This dog question is one thing that keeps us from raising sheep. I would rather not have sheep than get in trouble with my neighbors. There is no use talking about a license law unless public sentiment endorses the law sufficiently to keep it in force. And how are we going to raise public sentiment to that point?

Mr. Ziegler: It takes a certain class of men, irresponsible and with no respect for the law, to raise dogs. Our country is getting settled up with stockmen, cattlemen and horsemen and they will allow no one to go over their fields with a dog and when they see a dog around their premises they go for him with a double-barrel shot gun. We have had cases in our neighborhood where dogs have even attacked the cattle. A man told me that a boy with a hound and cur dog started to go through his field to hunt rabbits in an adjoining field and the dogs ran his horses into a barbed wire fence and cut one of them all to pieces. The farmers in our country have just gotten down to the point where they won't have dogs.

Mr. King: The dogs hurt my cattle eight or ten years ago and I took my gun and went into the field and shot them at long range and the next day my neighbor came to see me and said that I had killed his dog. I knew nothing about it, but he sued me for the value of that dog. The story has a laughable sequel. I recovered three dollars damages for his dog's trespass on my place. I did not know either of the dogs. One belonged to a man who lived on an adjoining farm and the other belonged to a man who lived four miles away, but when his owner knew that I had shot at his dog he was cool to me for five or six years.

Mr. Ziegler: In our State we have the right to shoot a trespassing dog. We have a dog tax and if the owner pays his tax, you are not allowed to shoot his dog in the public road nor where he is not trespassing, but whenever the dog enters your premises and becomes a trespasser, he will have to go, that is all there is to it.

Mr. King: I want to ask another question about the fences. You stated that sheep were more easily confined that any other class of stock.

Mr. Ziegler: Decidedly so.

Mr. King: What kind of fence do you use?

Mr. Ziegler: Anything that will hold the sheep. Take a three-board hurdle fence, for instance. Barbed wire is not good. That is getting out of date. The losses that you sustain on your farm will more than compensate for the difference in the price of your fence. I put barbed wire on top of my fences. I make 38-inch woven wire fence. They cannot get their heads over that and it is all right. An economical fence for all kinds of stock is a thirty-inch fence with three barbed wires above, and a good fence is a twenty-six inch fence with three wires. But I prefer thirty-six to thirty-eight inches and only two barb wires. The only objection to the woven wire fence is that the horses will stretch their necks over them and bend them down, but they will not do that if there is a barb wire on top of them.

SOME LESSONS FROM CATTLE FEEDING EXPERIMENTS.

(By F. B. Mumford, Prof. of Animal Husbandry, Agricultural College, Columbia, Mo.)

Missouri ranks among the richest states of the Union. Her enormous resources are the continual wonder of the people of other states. Her title "Imperial Mistress of States," has been justly earned. When we come to consider the basis for placing Missouri in a pre-eminent place industrially among the states of the Union, we are bound to discover that her industrial greatness is based directly upon agriculture. Unlike many of the wealthy eastern states and some northern states, she is not pre-eminent as a manufacturing center. While her mines contribute to a considerable extent to her great resources, Missouri is not after all one of the greatest mining states, but when we come to compare agricultural resources of Missouri with those of any other State in the Union we are bound to give her first rank among the commonwealths of America. If we examine still more minutely the resources of the State and attempt to classify her agricultural resources, we very soon come to learn that the live stock industry of Missouri is pre-eminently the greatest single industry of this great State.

Of all the animal products which contribute to the great sum total of Missouri's wealth, beef cattle is the greatest single item in the count. Missouri is not a dairy state, Missouri is not a sheep state, and while her horse stock and mule stock are large, still as compared with the immense returns from beef cattle they are comparatively small. We must therefore conclude that any information regarding the profitable production of beef is always a timely subject in Missouri.

Men engaged in the beef cattle business in this State may be divided into two classes, those who breed and rear their own calves and those who buy cattle from the ranges or from smaller farmers and feed cattle as a business. This latter class is a large class in this State and the feeders of Missouri have become justly renowned in the large markets of the country for their skill in feeding cattle.

It is my purpose to discuss for a brief time today some of the results which have been secured by the Experiment Stations of this country that may aid us in carrying on the business of cattle feeding more profitably. The experiment stations of America have devoted more time and attention to the problems of the stock feeder than to any other one subject connected with animal husbandry. It may be well for us, standing as we do near the end of the first score of years of experimentation in this country to ask ourselves what has been accomplished? What do we know now about feeding animals that we did not know before the establishment of the experiment stations? Surely this vast array of carefully planned and executed experiments numbering up into the thousands must have thrown some light upon the practical problems of feeding.

In determining the question as to whether the stations have succeeded in helping us to solve some of the difficulties which confront the feeder we must first undertake to decide what are the purposes and aims of the feeder and then what difficulties lie in the way of accomplishing these ends. Confining our attention now entirely to the cattle feeder we may say that the aim of the feeder is to produce a pound of beef at the lowest possible cost and to produce the quality of beef which the market demands.

COST OF PRODUCING A POUND OF BEEF.

One who has followed carefully the feeding experiments cannot but be impressed with the great variation in the amount of feed required to produce a pound of beef. I have made this somewhat careful study and I have found that the number of pounds of grain required to produce a pound of gain at the different stations has varied from 2 pounds to 15 pounds. Even when the same ration is used, the variations required to produce a pound of gain are very great. In one experiment at the Missouri Station where corn was the principal ration, three pounds of corn were sufficient to produce one pound of gain, while at the Kansas Station where corn was the principal grain ration it required 14 pounds of corn to produce one pound of gain. Now if the profit is largely dependent upon the amount of grain required to produce a pound of beef, then a knowledge of the conditions which make it possible to produce a pound of beef with one-half the quantity of grain, will be of the greatest possible assistance in determining upon the methods employed in profitable cattle feeding.

Table one illustrates this great variation in the amount of grain required to produce one hundred pounds of gain.

TABLE I.

GRAIN REQUIRED FOR 100 POUNDS GAIN FOR FATTENING CATTLE.

Station.	Kind of grain fed.	Age of cattle.	Length of feeding period.	Grain to produce 100 pounds gain.	Remarks.
Kansas Bul., 34, 60	Corn meal	3 years	6 months	1,122 pounds	Roughage corn stover
Kansas Bul., 34, 60	Ear corn	3 years	6 months	1,410 pounds	Roughage corn stover
Kansas Bul., 47	Dry shelled corn		5 months	1,105 pounds	Roughage corn stover
Kansas Bul., 47	Shelled corn soaked		5 months	938 pounds	Roughage corn stover
Kansas Report, 18	Corn and cob meal		140 days	732 pounds	Steers in thin condition at beginning
Kansas Report, 84	Corn meal		140 days	795 pounds	Steers in thin condition at beginning
Kansas Report, 85	Corn and cob meal		150 days	1,260 pounds	Half fat at beginning
Kansas Report, 85	Corn meal		150 days	1,166 pounds	Half fat at beginning
Kansas Bul., 34, 39 and 60	Ear corn	3 years	150 days	1,271 pounds	
Kansas Bul., 34, 39 and 60	Mixed grains (Balanced ration)	3 years	150 days	905 pounds	
North Carolina Bul., No. 93	Raw cotton seed		100 days	224 pounds	Roughage cotton seed hulls
Arkansas Report, 3rd	Raw cotton seed		100 days	209 pounds	Roughage cotton seed hulls
Iowa Bul., 20	Mixed grains	2 years	92 days	790 pounds	Nine breeds
Iowa Bul., 28	Mixed grains	2 years	6 months	956 pounds	Angus and Shorthorn
Michigan Bul., 44	Mixed grains	1 year	1 year	549 pounds	Six breeds
Michigan Bul., 44	Mixed grains	2 years	1 year	879 pounds	Six breeds
Michigan Bul., 69	Mixed grains	1 year	18 months	560 pounds	Five breeds
Missouri Bul., 24	Mixed grains	1 year	18 months	685 pounds	Four breeds
Missouri Board Agriculture, Sept., 1901	Corn	2 years	119 days	1,151 pounds	Roughage timothy hay
Missouri Board Agriculture, Sept., 1901	Corn	2 years	119 days	831 pounds	Roughage cow pea hay
Missouri Board Agriculture, Sept., 1901	Corn	1 year	80 days	*605 pounds	Roughage timothy hay
Missouri Board Agriculture, Sept., 1901	Corn	1 year	80 days	*301 pounds	Roughage clover hay
Missouri Board Agriculture, Sept., 1901	Corn	1 year	80 days	*1,160 pounds	Roughage sorghum hay
Missouri Board Agriculture, Sept., 1901	Corn	1 year	80 days	*445 pounds	Equal parts clover and corn stover

*Each steer received only 6 pounds of corn daily.

The table includes, as will be observed, a statement of the kind of grain fed, the age of the cattle, the length of the feeding period and in some cases the kind of roughage fed with the grain. It has been found that all of these factors influence considerably the profit from feeding. A careful study of this table and of other feeding experiments will give us some very accurate data of the factors involved in profitable cattle feeding.

Among the most important factors which determine the profit from cattle feeding are the condition of the animal at the beginning of the feeding period, the age of the animal, the kind of feed fed, the methods of feeding, and the length of the feeding period. It is not proposed now to enter into any discussion of the different phases of this question, such as the cost of the animals at the beginning of the experiment and their value at the end because these vary with every season, but the facts which I wish to present to you are facts which have been determined and will under most circumstances remain more or less constant from year to year.

CONDITION INFLUENCES ECONOMY OF GAIN.

Assuming that the animal is in good health we may make the sweeping statement that the thinner the animal at the beginning of the feeding experiment, the more rapid he will gain and the more gain he will produce from any given quantity of grain. As the animal increases in fatness, the increase in live weight becomes more and more costly, that is, it requires more and more grain for each pound of gain. This is shown in all feeding experiments that have continued for a longer period than four months.

Table II. Cost of Gain Greater in Long Feeding Periods.

	Feed for 100 pounds gain.	Increase of feed required.
Up to 56 days steers required........	730 lbs. of grain	
Up to 84 days steers required........	807 lbs. of grain	10 per cent.
Up to 112 days steers required........	840 lbs. of grain	15 per cent.
Up to 140 days steers required........	901 lbs. of grain	23 per cent.
Up to 168 days steers required........	927 lbs. of grain	27 per cent.
Up to 182 days steers required........	1,000 lbs. of grain	37 per cent.

Table II is taken from Kansas Bulletin 34 and shows firmly that as the animal becomes fatter, the amount of grain required to produce a pound of gain is greater.

Table III. Grain Required to Produce One Pound of Gain—Winter Feeding.

	Length of feeding period.	First month of feeding period.	Last month of feeding period.
	days.	pounds.	pounds.
Kan. Sta. Bul. No. 34..........	182	7.3	10.0
Kan. Sta. Bul. No. 60..........	145	10.2	15.4
Mass. Sta. Bul. No. 113..........	142	7.7*	15.7*
Mich. Sta. Bul. No. 69..........	150	6.2	9.3
Average		7.8	12.6

*Dry Matter.

Comparing the first month of the feeding experiment with the last month, we find, as shown in Table II, that the cost of gain is very much less the first month of the feeding period than at any other later time. In the light of these results, the practice of buying half fat cattle and finishing them the last two months of the feeding period cannot be considered generally profitable. This, however, will of course depend upon the price at which the animals may be purchased and the price which may be secured for them when finished.

AGE AND ECONOMY OF GAIN.

It has been definitely demonstrated in a large number of experiments under widely different conditions that the cost of producing a pound of gain is dependent upon the age of the animal. The younger the animal, the less feed is required for a pound of gain. As the animal becomes older, increasing amounts of feed are required to produce a given gain. The influence of age upon the profit from cattle feeding has however unfortunately been complicated with the condition of the annimal. Manifestly it is not fair in feeding experiments to use the results secured from feeding an animal from birth to three years old to determine the relative cost of producing a pound of gain at each of these periods. The only fair comparison is a comparison of thin yearlings with thin two year olds and when this comparison is made, the influence of age is not so marked. However, accepting the results from the experiments already tried, it seems to be true that a pound of gain costs one-half as much on calves up to 12 months old as upon two year olds. In this fact we see a very reasonable argument for the production of baby beef. If it is true that we can produce gain much cheaper on young animals, and if at the sametime it is true that these young cattle properly finished will bring almost as much per pound as the older animals, then there must certainly result more profit from feeding the young animals, and it must follow that the production of baby beef is a more profitable business than the ordinary methods of cattle feeding.

THE KIND OF FEED FED.

Experiments have also shown clearly that there is a great difference in the efficiency of different feeds in producing gain. As will be seen by reference to Table I, at the North Carolina Station 224 pounds of raw cotton seed produced 100 pounds of gain. And at the Arkansas Station 209 pounds of the same grain produced also 100 pounds of gain. However, it will be observed that the feeding period was a short one and that in all probability the animals were very thin at the beginning of the fattening period. At the Kansas Station corn, either in the ear or shelled, required from 1,100 to 1,400 pounds of grain to produce 100 pounds of gain.

It has been generally supposed that the roughage in the feeding ration was not particularly important. This belief, however, while quite commonly held among some very large cattle feeders has never been based upon an accurate experiment. The Missouri Experiment Station particularly has demonstrated that the roughage in a ration may add as much as one-third to its efficiency. The Missouri experiments were all planned and executed by Director H. J. Waters and have attracted widespread interest throughout the cattle feeding districts of the west. In a feeding experiment lasting 199 days, two yearling steers fed on corn and timothy hay required 1,151 pounds of corn to produce 100 pounds of gain, whereas the same class of cattle fed the same length of time on corn and cow pea hay required only 831 pounds of corn to produce 100 pounds of gain. Other experiments at the Experiment Station have shown clearly that nitrogenous fodder rations like clover hay, cow pea hay and alfalfa hay have invariably given markedly better results than has timothy hay and corn fodder or sorghum hay.

Table IV records the results of feeding these kinds of roughness to cattle on full feed.

Table IV. Different Roughnesses for Fattening Steers.

First Trial Jan. 6, '01—April 16, '02. 100 days. 4 2-year-old steers per lot. Full feed. Shelled corn.

Kind of feed.	Corn eaten, bushels.	Hay eaten, lbs.	Total gain, lbs.	Av. daily gain, lbs.	Gain per bus. corn, lbs.
Corn—timothy.........	166.5	3,813	802	1.69	4.80
Corn—cow peas........	188.0	3,662	1,257	2.64	6.68

VALUE OF NITROGENOUS ROUGHAGE IN CATTLE FEEDING.

Not only has clover, cow pea and alfalfa hay proven to be of very great efficiency in connection with corn for fattening cattle, but it has also been shown by experiments, also by the Missouri Station, that when yearling cattle are wintered on a light grain ration, when they receive clover, cow pea or alfalfa hay they make a much greater gain on a given amount of corn than when fed timothy, corn fodder or sorghum hay. These results are recorded in Table I and may be studied by reference to that table. It has been shown repeatedly that corn can be made more efficient by balancing the ration with some material like cotton seed or linseed meal, which is made up largely of nitrogenous or protein substances. It ought to be no surprise, therefore, that these nitrogenous fodders will produce so much better results than timothy or corn fodder.

Another thing significant in this experiment is the possibility of utilizing to much more profit the corn fodder which is now largely wasted on many Missouri farms. By combining corn fodder and clover hay half and half we have succeeded in producing a pound of gain on yearling steers by feeding 445 pounds of corn.

GAINS MADE ON PASTURE.

The cheapest gains made on cattle in Missouri are those made while the cattle are on pasture. Most of the books on cattle feeding insist that feeding grain to cattle on pasture is unprofitable. It is nevertheless true that the practical cattle feeder in Missouri continues to feed a full fattening ration to cattle on pasture. He finds this method to be the most profitable and successful way of finishing cattle. We have but one experiment at the Missouri Station in summer feeding to compare with several winters' work in the winter feeding, but the results so far secured are certainly very favorable to summer feeding rather than winter feeding.

WINTER AND SUMMER FEEDING COMPARED.

Table V. Winter Experiments Extending Over Five Years.

	Pounds.
Total grain fed	238,872.00
Total roughness fed	91,450.00
Total gain in weight	23,910.00
Average amount grain per lb. gain	10.00
Average amount roughness per lb. gain	3.82
Average grain daily per steer	21.29
Average roughness daily per steer	8.15
Average daily gain per steer	2.13
Summer—Experiments Extending Over One Year.	
Total grain fed	120,279.00
Total gain in weight	16,709.00
Average amount grain per pound gain	7.19
Average amount grain per steer daily	18.42
Average daily gain per steer	2.56

815 lbs. hay eaten daily in winter at $6 per ton is 72.3 cents per month per steer. Thus roughness about offsets pasture, having more rapid and cheaper gain, besides requiring less labor and steers to do better.

Table V gives the result of winter and summer feeding at the Missouri Station. It will be observed that the average amount of grain required to produce a pound of gain during the winter is 10 pounds, while in summer feeding it requires only 7.2 pounds of grain to produce one pound of gain. In summing up, then, we must conclude that the cheapest gains are made on young steers while grazing. At the Missouri Station, however, results as favorable were secured while feeding yearlings on a partial grain ration with clover hay. The costliest gains are those made from feeding three-year-old steers in half-fat condition at the beginning of the feeding period, on an unbalanced ration of corn and timothy hay, and especially if fed for a long time.

Averages are not of very great values, but in general we may conclude that the two-year-old steers on a short feed on pasture will gain 100 pounds for each 400 pounds of grain eaten. A long feed under the same conditions will require 600 pounds of grain for each 100 pounds of gain. A short feed in winter on dry feed exclusively, will require 750 pounds of grain for 100 pounds of gain and during a long feeding period under like conditions, from 1,000 to 1,500 pounds of grain will make 100 pounds of gain. With younger cattle fed under the same conditions as above, less grain will be required in every instance to produce one pound of gain.

DISCUSSION OF PROF. MUMFORD'S PAPER.

Mr. Ziegler: In feeding you can put a great many more pounds on younger than older animals with the same amount of feed, but it requires a longer feeding to bring the young animals to perfection and to get the necessary fat to make good beef than in the older ones, does it not?

Prof. Mumford: No sir, I cannot say that this is true, except in this sense, you cannot sell a calf for beef; you must carry the animal up to a certain weight before you can sell him at a profitable price on the market.

Mr. Ziegler: What are the final results? Take for instance a calf that will weigh 500 pounds will gain twice as many pounds as a steer that weighs a thousand. You will increase the value of the 500 pound calf up to the value of the selling price, while in the steer you increase the thousand pounds up to the market value, and when you do that, which will give the best result?

Prof. Mumford: It depends on conditions. I am trying to limit this question to the amount of grain required. As to the commercial side of the question, that is another proposition. When you buy a two-year-old, say weighing a thousand pounds, for three cents a pound and fatten him to sell for five cents a pound, you can get a gain of two cents a pound on the original weight, which is a profit you cannot get on the six hundred pound animal. The calves sell for more per pound in this State. You can buy a thin two-year-old at at least a cent a pound less than a calf.

Mr. Ziegler: In the experiment with the raw cotton seed meal, what was the result on the hogs that followed the cattle?

Prof. Mumford: Apparently the result was favorable, only this of course is true that the hogs probably got very little value from the cotton seed. Of course, they got very little value from corn meal fed to cattle. It is generally understood that cotton seed meal is injurious to hogs. Cotton seed meal is not injurious to hogs, however, following cattle that are being fed on the meal.

Mr. Ziegler: Is it not also injurious to cattle?

Prof. Mumford: Sometimes it has been injurious, but clover is injurious to cattle sometimes, and various other things, but in many of the southern states they have succeeded in fattening cattle successfully on nothing but cotton seed hulls and cotton seed meal.

Mr. Ziegler: Were the fodder and clover fed once a day?

Prof. Mumford: We fed fodder twice a day. We fed a roughage to the cattle twice a day and grain once a day. We fed the roughage morning and night. They got all they would eat.

Mr. Ziegler: A gentleman wants to know how you knew what proportion of fodder and clover was given?

Prof. Mumford: We mixed the fodder and clover hay equally.

Mr. ————. Was it shredded fodder?

Prof. Mumford: No, ordinary long fodder.

Mr. ————: How was it fed?

Prof. Mumford: In two different ways. The first two winters we left it in the field and drew it out as we needed it, not because it was best but because that is the way the Missouri farmer feeds it, and we wanted him to have confidence in the results produced according to his own conditions, if possible. But the last two years we have been keeping the fodder inside with better results, of course.

Mr. Ziegler: Did you feed as much as 21 pounds of grain a day?

Prof. Mumford: Yes, 21 pounds.

Mr. Ziegler: Did hogs follow the cattle?

Prof. Mumford: In every case. There was no corn thrown out. This is the amount of corn the cattle actually ate. There was nothing cleaned out of the troughs. It was shelled corn in every case.

Mr. ————. Do you call that a full feed?

Mr. Mumford: Yes, sir. I am between the devil and the deep sea; part of you seem to think the ration did not have enough corn, and the rest seem to think it was too much.

Mr. Harned: It was hardly a full feed. We count half a bushel to a steer, twenty-eight pounds, or half a bushel, but you fed only twenty-one pounds.

Prof. Mumford: It was all consumed, there was no waste at all.

Mr. Harned: That is about an average feed?

Prof. Mumford: These are the results of five years' work.

Mr. ————: Do you shelter your stock in winter?

Prof. Mumford: Yes, in sheds open to the south.

Mr. Ziegler: What kind of grass did you use?

Prof. Mumford: Missouri blue grass. There is nothing better. The pastures were not over-stocked and the cattle were in ideal conditions so far as the pasture is concerned.

Mr. Ziegler: What has been your experience with blue grass? I had cattle on blue grass this year and they would not fatten.

Prof. Mumford: It was too watery. Last year, the dry year, we produced better gains on cattle on pasture than ever before.

Mr. Ziegler: I fed grain on pasture this year.

Mr. Maitland: I did the same thing.

Prof. Mumford: Our cattle gained 2½ pounds a day this summer.

Mr. Ziegler: My cattle gained four pounds a day while I fed them with corn.

Prof. Mumford: Our cattle gained 3⅓ pounds during June. We weighed the cattle three times before we began the experiment, three successive days.

Mr. Ziegler: Do you think shelter is more necessary for calves?

Prof. Mumford: Undoubtedly. It is true that the smaller the animal the more surface is exposed and the less the animal eats, the less heat is generated. The animal that consumes twenty pounds of hay and ten pounds of fodder is necessarily generating a large amount of heat. A calf that consumes only half as much grain and fodder generates only half as much heat and has a much larger proportion of the exposed surface and I should suppose the results would not be so favorable when they were exposed. They ought to be better protected.

Mr. Gabbert: I believe beef cattle do better in the open air, but I have seen days when the wind blew hard from the northwest in cold weather when you could not feed them enough and they would lose during that period.

Prof. Mumford: You are undoubtedly right. During one winter, particulary, in these experiments, that very cold winter when it was 25 degrees below zero, the cattle lost for one period of ten days. It would have been better if we could have kept them under shelter during that cold weather, but taking the average weather, there is more danger of our cattle getting too warm during the average feeding period. You can keep a dry bed with a shed and you cannot do than in the open lot. A very important thing is to have the cattle lie down as much as possible.

Mr. Gabbert: When it is warm and dry I turn my cattle out, and when it is cold I put them up, so they will gain all the time.

Prof. Mumford: That is a good practice, there is no doubt about that.

Mr. Ziegler: What you want to do now is to see that your Agricultural College has a good appropriation. Prof. Mumford has given us much good information and he will do much for the people of this State if you will just give him half a chance. I have seen enough of him here to know what I am talking about. If you want good results, support him. You have the right man to do the work.

RESOLUTIONS.

Mr. Ellis: I desire to offer the following resolutions:

1. Resolved, that a vote of thanks be given by this Association to the members of the press who have taken such interest in publishing the proceedings of this meeting, and to the Springfield Club for the courtesies they have extended, and especially to Mr. Geo. F. Reed, President of the Missouri State Road Association, for the interest that he has taken in the meeting and the untiring efforts he has exerted to make it a success.

2. Resolved, that we extend the thanks of this Association to the gentlemen visiting from other states, for the very able assistance they have rendered in the proceedings of this meeting.

We have a gentleman here from Iowa and one from Illinois, and I want to say in support of that resolution that very complimentary remarks have been made about the part that these gentlemen have taken on the program, certainly a compliment to the gentlemen and a compliment to the states from which they come; and as Missourians we are proud to welcome them to this State and we are glad that they are here for the purpose of helping to arouse an interest in improved methods of stock breeding and feeding and also to teach us what they have learned by experience in our sister states.

Resolutions adopted as read.

FARMERS' INSTITUTES.

An abstract of the Lectures Delivered Before the Meetings in 1902.

PEACH GROWING IN MISSOURI.

(By Prof. W. L. Howard, Asst. Horticulturist, Experiment Station, Columbia, Mo.)

Peach growing has become one of the important industries of Missouri. With varying degrees of success, the fruit may be grown in almost any locality in the State. However, like everything else that grows, the peach has its preferences as to soil and location. With a little extra care a small orchard for family use may be grown under unfavorable circumstances, but where it is desired to plant a commercial peach orchard, the subject is one worthy of careful consideration.

THE SOIL.

Missouri has a great diversity of soils varying from the deep, rich, well-drained loess formation along the bluff sides of the Missouri river, through all the gradations of deep, black soils of much of north Missouri, the moderately deep soils underlain by hard-pan; the gravelly soils with porous clay subsoils, so characteristic of the Ozark region, to the sandy lands and swamps of some of the southeastern counties. Peach trees will grow in all of these soils except the swamps, and produce some fruit, but for the large plantings we should avail ourselves of the natural aids as far as possible.

The chief requirement of a soil for successfully growing peaches is that it be porous enough to afford good bottom drainage. This is of far more importance than fertility. There are many places where the soil is rich enough to make good land for general farming purposes, but which is wholly unfit for either peach or apple trees because of its very hard, compact, clay (known as hard-pan) beneath.

Wherever there is a hardpan subsoil the roots of the trees find great difficulty in penetrating it and, being so near the surface, they soon use up the mineral food matter there, and also are more easily injured by dry weather. But worst of all is that water stands in such a soil and there is no surer way of injuring the vitality of the trees, if they are not killed outright. The roots of fruit trees must have a certain amount of air before they can grow and if they are submerged in water a part of the time more or less injury will follow. It does not matter so much about the exact character of the subsoil so long as it is porous, but of course it must not be too open or it would not retain moisture. A soil that is underlain by a sand or a gravel bed, unless it be several feet down, would be unfitted for growing fruit trees.

A rich soil is not necessary for growing good peaches. On the contrary, land may be too rich, in which case the trees would spend most of their energy in making good wood growth and bear but little fruit. Moderately fertile soil is best adapted to peach growing. The best soil in the State for peaches (as well as apples) is that peculiar formation known as "loess," which is found along the bluffs of the Missouri river, especially from about St. Charles to the northwestern corner of the State. There is some of this formation along the Mississippi river from near St. Louis to the Iowa line. There are also two areas of "loess" soil in southeastern Missouri, mostly in Scott and Stoddard counties. The "loess" soil is very fine in texture, but is quite porous and the roots of fruit trees in it penetrate to almost incredible depths so that no ordinary drouth could seriously affect them. Always lying along the bluffs, the "loess" lands of the Missouri and Mississippi rivers are very rough, being much broken by hills and hollows. Although hilly, this land does not wash badly, the water flowing through the soil rather than over it.

Aside from the "loess" soil, which is limited, the best peach soils are to be found in the Ozark region of the south half of the State. However, it must not be forgotten that there are many successful orchards of that fruit in Northern Missouri, but conditions are such that the latter region is not likely to become noted as a peach center. In the Ozarks the surface soil is usually rather thin and, as a rule, not well adapted to the growing of grain crops continuously, but with rare exceptions the entire region has a gravelly-clay subsoil which makes it well adapted to the growing of fruit. River bottom lands are not suitable for peach orchards.

SITE AND LOCATION.

A matter of almost as great importance as the soil is the choosing of a site and location for a peach orchard. By site is meant the exact situation of the orchard, whether in a valley, on a high level place or on a hillside, while by location would be understood the distance from a town or railroad. If the orchard is planted for commercial purposes it must be located so as to have access to a market. It is expensive and also difficult to have to haul peaches far to market. Every large commercial peach orchard should be located on a railroad or near enough to one to have a spur running into the orchard. Apples, after barreling, may be hauled for miles without serious injury, but peaches are too tender and juicy to stand such treatment, even if economy would permit of it.

The man who owns a farm and wishes to have a small orchard may exercise considerable choice as to the site. Opportunity is offered to select from high land, low land or hillsides, but the large grower is compelled to use the land as he finds it or have his orchard in spots which would not be advisable. If the orchard to be planted is small and there is a large area to select from, the most desirable site would be on a north slope where the trees would remain cool as long as possible in early spring.

In general a peach orchard should be situated on high ground—not necessarily high as to altitude, but higher than the land immediately adjoining or surrounding it. A level plain, no matter what the altitude, would not be as desirable a situation as a ridge of low altitude, but yet slightly higher than the surrounding areas. The orchard must have good air and water drainage. At times it is as desirable to have the air flow off as it is the water. Every one has noticed when traveling across the country at night in early spring that the air is warm and comfortable on the hills, but quite chilly in the valleys. This is due to the fact that cold air is much heavier than warm air and when it begins to get cool on the ridges the cold air slowly rolls off down into the valleys and will continue to flow down like water. If conditions favor this drainage, the cold air will be drawn off and the warm will remain.

In early spring, about blossoming time, a matter of one to three degrees in temperature about the trees is very important and may determine the success or failure of the crop. Experience has repeatedly shown that paying crops are produced on high ground, while in the valleys and lower levels there are often failures.

PREPARATION OF THE LAND.

Plow the land in the fall before setting the trees in the spring. New land is well adapted to the growing of peaches, but they may also be grown on old land which is very low in fertility, but more skill will be required in their management. In spring, harrow and stir the soil like preparing for corn. Indicate the rows and the position of each tree by marking off the field into checks with a single-shovel plow or by a series of stakes.

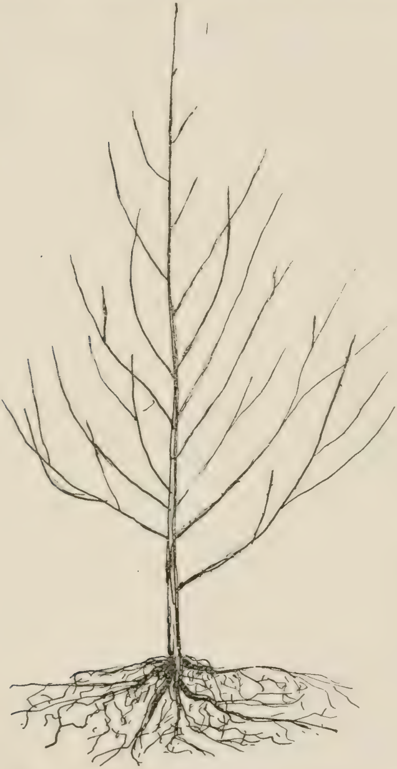


Fig. 1.—One year-old tree from the bud as it comes from the nursery.

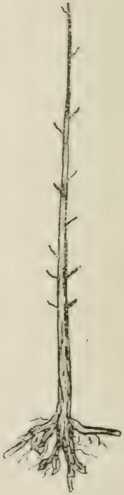


Fig. 2.—Same as Fig. 1 pruned ready for planting.

The distance apart the trees should be set depends upon the kind of soil. In localities where the soil is rich and peach trees are known to grow large, they should be at least twenty feet apart each way. This would give 108 trees per acre. In a general way, much of the central and northern parts of the State will require trees to be this far apart. In the great Ozark region and in almost the whole south part of Missouri the trees may be set 16½ by 16½ feet each way, which, of course, makes 160 per acre. They should not be closer than this in any soil.

PREPARATION AND PLANTING OF THE TREES.

In selecting peach trees, it should be borne in mind that it pays to have good ones, a poor tree being dear at any price. A good tree is one that has made a vigorous, stocky growth. The largest trees are not necessarily the best. They should be one-year-old from the bud, five-eighths to three-fourths of an inch in diameter and about four feet high. Trees five and six feet high are too large.

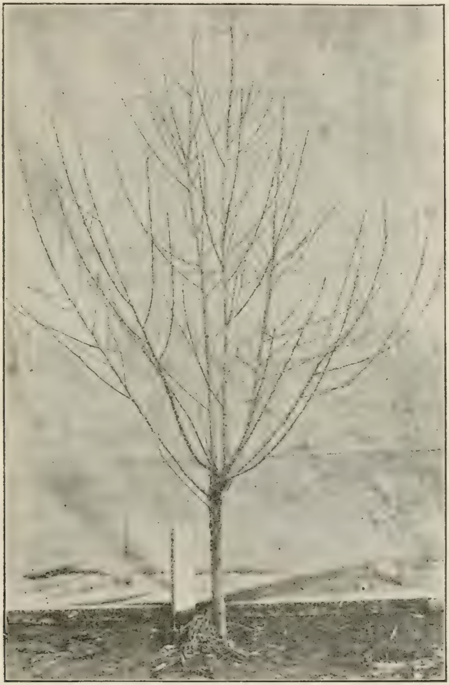


Fig. 3.—A shapely peach tree after two years' growth in the orchard.

The preparation for planting consists in shortening back the side roots so that they will be about six inches in length. The branches are all to be cut back to within about an inch of the body, leaving only one bud on each stump. All branches are to be cut away smoothly against the body up to a height of about twelve inches, so the trees will be headed at this distance from the ground. The tops are to be cut off at a point about 24 to 30 inches high. See Figs. 1 and 2 for tree before and after being trimmed for planting. It is unnecessary and undesirable to have the trees headed higher than 12 inches.

Great care should be exercised in handling the trees before planting. The roots should not be allowed to be exposed to the sun any more than can be helped and neither should they be in the wind if the day happens to be cloudy. Sun and wind acting together quickly dry out and greatly injure the root of the peach. A prominent fruit grower was asked how long it was safe to leave the roots of the peach exposed. The answer was, "about as long as you can hold your head under water." This was a forcible illustration, and, while not literally true, serves to emphasize the importance of protecting the roots. While the roots of apple trees are also injured by exposure to sun and wind, they will stand worse treatment in this respect than peaches.

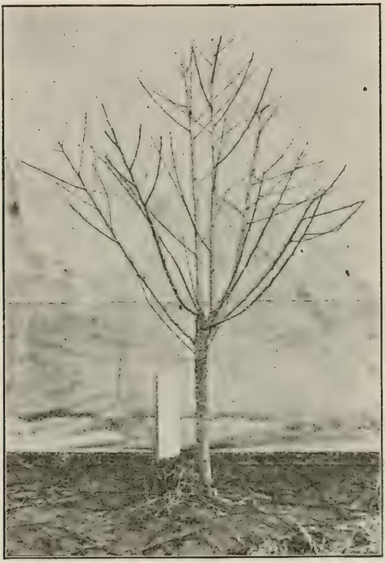


Fig. 4.—Same as Fig. 3, after being properly pruned.

Immediately upon receiving trees from the nursery they should be unpacked and heeled in. Dig a trench ten or twelve inches deep with one sloping side. Place the trees in the trench, leaning them well over and cover the roots with soil. Give them plenty of room where they are heeled in so that all of the roots will some into contact with the earth and be kept moist and green.

A sled is the best vehicle with which to haul the trees to the field, being low and convenient, but an ordinary farm wagon may be used. Pack wet straw around the roots while the trees are being moved. In setting, two men should work together, perhaps assisted by a boy if the trees are in a wagon. One man prunes the tree, top and root, as described, while the other digs the hole. The root system being in sight, he knows exactly how deep the hole should be and thus no time is lost by having to fill in or dig deeper after trying the tree. The tree should be set at the same depth it grew in the nursery. One man should hold it in an upright position while the other shovels in some fresh soil and works it about the roots with his hands. This process is very materially aided by slightly churning the tree up and down, which causes the loose, friable soil to settle into all of the crevices. When the earth is packed under the roots as well as over them, pack down well with the foot. When approximately level with the top of the ground, tramp firmly. Before leaving the tree, spread a thin layer of loose soil around it to prevent the ground from baking.

After the trees are planted, go over the orchard and protect them with wooden veneer wrappers, using those twelve inches long and sticking each wrapper into the ground one or two inches. In putting on the wrappers, wind them loosely about the trees so as to leave a space about two and one-half inches in diameter for the trees to stand in. This will permit of a free circulation of air and the bark will not be injured in the least. The wrappers are very useful for keeping out borers and may be left on the trees until they wear out. To keep the borers from getting in, it will be necessary to go through the orchard each spring and push the wrappers into the ground again as the part in contact with soil generally rots off in a year. Fasten the wrappers on by wiring near the top and bottom. Wooden, veneer wrappers may be had of basket and box companies for $3.50 to $5.00 per thousand.

CULTIVATION.

Give the peach trees clean culture throughout the first season by stirring the soil at least after each rain. If the land is rich, clean culture may be practiced every year, but it is thin and needs enriching, turn in spring and cultivate until the middle of June or first of July and then sow to cow peas. This crop will greatly improve the fertility of the soil even though the peas are cut for hay.

The best tool for cultivating an orchard is Clark's Cutaway harrow, wherever it can be used. In stony or stumpy land a cutaway could not be employed. An Acme harrow is a splendid tool to follow the cutaway to level and pulverize the soil. The Acme would be sufficient to use after each rain to break the crust. Unless the soil was badly baked it would not be necessary to turn the ground in spring, as spading up with the cutaway would usually be sufficient. The idea is to keep the surface soil stirred through the season until August, so that it will retain its moisture.

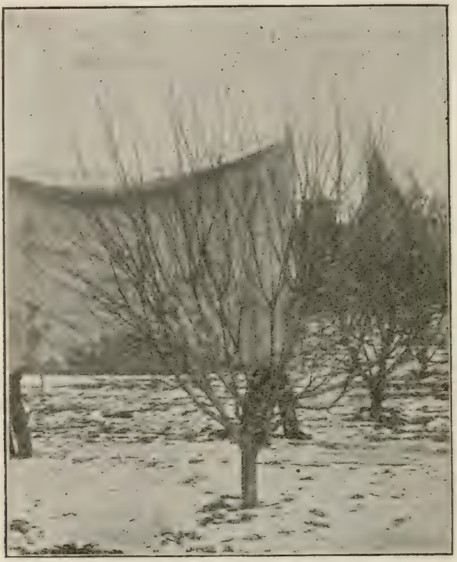


Fig. 5.—A 4-year-old peach tree before pruning. Beyond it is a tree "baled" and ready for having cornstalks placed around it for winter protection.

LATER PRUNING.

In pruning peach trees, it should be remembered that it is always desirable to keep the tree low and spreading, for convenience in picking the fruit. When peach trees become six or eight years old or more, the wood becomes very brittle and as the fruit is always borne on the new wood (that which grew the previous season) the branches, if long, are liable to break off under a good crop of fruit. Such trees are much mangled by pickers in drawing down the branches to reach the peaches and also by ice storms in winter. It might almost be said that it is a fortunate thing that peach buds are occasionally killed by severe winters. This will give the grower an opportunity to cut the trees back quite severely and thus reduce their size and induce a new supply of thrifty wood growth. All pruning should always be done in late winter.

After the little trees have had one summer's growth after being planted, they will be branched in all directions and will require shaping.

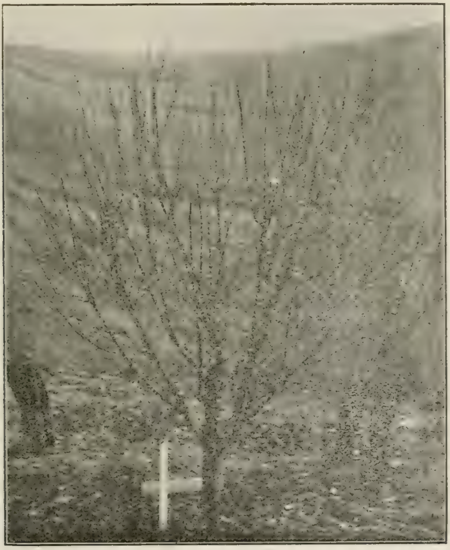


Fig. 6.—A closer view of the first tree shown in Fig. 5, and how it looked after being pruned for thinning the fruit.

This is done by trimming off perhaps one-third of the new growth, thus giving a rounded head to the trees. In Fig. 3 is shown a tree after two years' growth in the orchard and Fig. 4 shows the same after being properly pruned. The third season in the orchard should see the trees producing some fruit and in another year there should be peaches in paying quantities.

When the trees have reached bearing age, the pruning is necessary for the thinning of the fruit as well as for directing the shape of the tree. Peach trees uniformly set more fruit than they should be allowed to try to ripen. In pruning bearing trees about one-half of the wood of the previous season's growth should be cut away. See Figs. 5 and 6 for such a tree before and after pruning.

When it is found in late winter that the fruit buds are killed, the opportunity should be seized to cut the trees back more severely than usual, cutting back into two and even three-year old wood. If the wood is blackened inside and shows injury from freezing, the tree should be cut back still more severely.

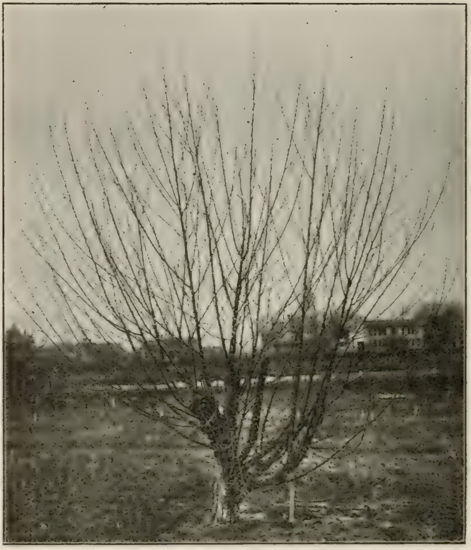


Fig. 7.—The first season's growth after severely cutting back an old peach tree which had been severely injured by freezing.

In rare instances, as in the winter of 1898-9, peach trees became so badly damaged by freezing that the growers seriously considered the advisability of digging up entire orchards. Often the wood was found to be discolored throughout in the greater part of the main branches, and even in the trunks. However, many of these trees were saved by excessive pruning. A typical example of the results of such pruning after having one summer's growth is illustrated in Fig. 7. To properly prune the long growth on the cut-back trees, see Fig. 8.

WINTER KILLING OF THE FRUIT BUDS.

We are often asked what temperature will kill the fruit buds of the peach. This will depend wholly upon circumstances. Under certain conditions the buds can safely withstand a temperature of twenty degrees below zero, while at other times ten degrees below will kill them all. The principal cause of the killing of the fruit buds is that during sunny days in late winter, the buds will absorb sufficient warmth from the sun to stimulate them into a very slight growth. This growth is not perceptible to the naked eye, but is readily detected by the aid of a magnifying glass when the bud is carefully split open. Contrary to popular opinion, this growth takes place independent of the roots, as the ground may be frozen hard to a depth of several inches and there can be no movement of sap.

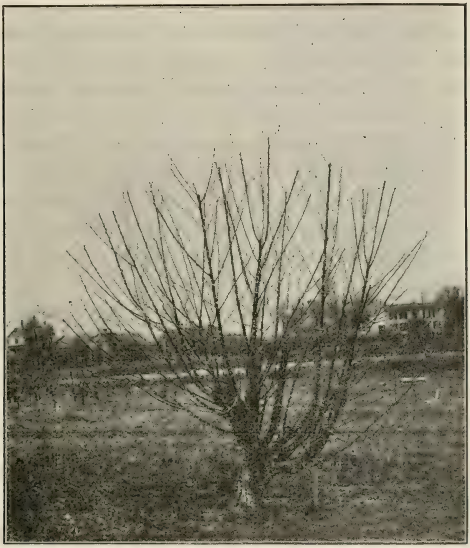


Fig. 8.—How Fig. 7 was pruned.

Then the extent of the injury from subsequent freezes will depend largely upon the extent of the growth that has taken place in the buds. If there has been several successive days of warm weather in February or late in January, zero weather afterward is liable to kill a great many of the buds, and a few degrees below zero will destroy them all. If the buds are perfectly dormant, they will sometimes withstand a temperature of 20 degrees or more below zero without injury.

WINTER PROTECTION.

Since the buds are stimulated into a slight growth by the sunlight, a shade over the trees will sometimes prevent the growth. It would be too expensive to build sheds over the trees, so the next best thing is to protect them by whitewashing or "baling."

The former method of protection has for its basis the fact that certain colors, notably the darker shades, absorb or take up the sun's rays and thus become warm, while the light colors, like the pure white reflects or throws off the rays from the sun and thereby remain much cooler. By actually sticking thermometers into holes bored in peach twigs growing side by side, one of which was painted over with lamp black and the other with lime whitewash, there was a difference of 27 degrees in a few minutes during bright sunlight. The practical application of this principle is to cover the branches of the peach trees with a coating of whitewash, which is quickly done by using a spray pump. As indicated, this will keep the buds cool and they are not influenced by sunlight. However, if there are several successive days of warm weather, until the atmosphere becomes warm, this method is sometimes ineffectual.

The "baling" process consists in drawing the branches upward and inward with ropes and, when the upper limbs are all drawn tightly together, they are bound in that position with cords. See Fig. 5, to the right. In this way the branches shade one another and do some good, but it is much better to cover the baled trees with a layer of corn fodder, using the whole stalks, which are held up by a strong string or wire wrapped around the entire mass. This protection will not save the buds if the weather remains warm for a week or so any time in February, and is followed by a sharp freeze.

PICKING, PACKING AND MARKETING.

It should always be remembered that peaches require the utmost care in handling and it will take much vigilance on the part of the grower to see that this is done. In the first place peaches should not be picked until ripe, even for long shipments. Begin picking the fruit when it will part readily from the stems, but do not wait until it begins to get soft. The stage for picking cannot be determined by the color alone. The fruit cannot all be harvested at once, but may require as many as four or five pickings, but usually about three. Use one-half bushel fruit baskets, with bottoms padded with three or four thicknesses of burlap and see to it that a peach is never dropped in, but must be carefully laid in place.

Place the basket in spring wagons to haul to the packing sheds which, if possible, should not be more than a quarter of a mile away. Handle the fruit as little as possible. Allow it to cool off and pack out of the baskets, at the same time sorting into grades. The grades should be as follows: Fancy, No. 1, No. 2 and culls. The first, of course, will consist of the largest, most shapely and highest colored specimens; No. 1's the bulk of the best fruit; No. 2's that which is slightly off in size or color but sound; and the culls will consist of bruised, broken or over-ripe specimens. Much of this last may be sold on the ground and the remainder sent to the evaporator. The fancy specimens should be packed in small baskets or boxes, holding a dozen or dozen and a half, to supply special markets. The No. 1 grade should be packed in one-half peck baskets and these baskets packed in either four or six-basket crates. The No. 2 grade may be packed in one-third bushel baskets which are also crated.

Load the fruit on refrigerator cars as soon as packed, leaving spaces between the crates, and in addition a space of at least two feet is always to be left in the top of the cars. If this space is filled with crates, the warm air will rise and quickly cause the fruit to decay. If peaches are well loaded, they will ship perfectly and may be kept from five to seven days after they reach their destination.

It is now becoming possible to sell peaches on track (that is, as soon as the cars are loaded agents on the ground will buy them, paying cash therefor.) This is the most satisfactory way of disposing of a large crop. When it is not possible to ship in car load lots, the fruit may be expressed and the smaller towns are usually the best markets. Western and southern markets usually demand large packages, while the eastern and northern markets require smaller packages and a better quality of fruit.

VARIETIES.

The question of what varieties of peaches to plant is quickly disposed of. It depends on what they are wanted for—home use, to dispose of in a local market or for shipment. For a family orchard there should be a succession of ripening fruit from the earliest to the latest. There are a number of early ripening peaches, but most of them rot badly and it is very difficult to grow them. Perhaps the best early peach, because usually the freest from rot, is Mt. Rose. For a summer variety to follow Mt. Rose, Family Favorite would give satisfaction. This is a splendid fruiter and does not rot badly and ripens in July. Elberta is an old standard among peaches, fairly hardy of bud, free from rot and a good shipper; it should have a place in any planting. Ripens middle of August. Champion is a desirable variety especially for North Missouri where it is the most serious competitor of the Elberta. It is said to be hardier at the north than the Elberta, but is not such a favorite in the southern part of the State. Another August peach, well known to most people, is the Old Mixon Free. Of fine quality and good size, but too soft to ship well. Picquet's Late is a desirable September variety. Mrs. Brett is a seedling of the Old Mixon and is of good quality. Salway is the best late variety, ripening the last of September. The Henrietta ripens toward the last of October and is said to be hardy, productive and a sure bearer. This last is a clingstone, all of the others mentioned before this being freestones. Heath Cling and Old Mixon Cling are the leading clingstones for all localities. Crosby is popular at the north on account of its hardiness of bud; it is a clingstone.

For a local market where the fruit is to be peddled out, there is usually a big demand for clingstone varieties of good shape for home canning. The Old Heath Cling is one of the best sellers for this purpose. Family Favorite and Elberta also sell well on a home market. Mt. Rose would supply the early demand.

For shipment it is found that the only useful varieties are those that are able to travel long distances and arrive in good condition. The Elberta answers this purpose best of all, and is the leading commercial variety of the South Missouri peach districts. It is often urged against the Elberta that it is of inferior quality, but so long as the market demands it, and no better shipper can be found, this variety will continue to be very largely grown. Mt. Rose is grown to a limited extent for shipment and the Salway is planted for late markets.

In brief, the following are recommended: For a home orchard, Mt. Rose, Family Favorite, Elberta, Champion, Old Mixon Free, Picquet's Late, Salway and Henrietta. For a local market, Mt. Rose, Elberta and Heath Cling. For a commercial orchard Elberta should constitute the main crop (except in North Missouri where Champion should take the lead), and a comparatively small acreage of Salway for the late market. It is not advisable to try to grow Mt. Rose in a commercial orchard as it is too susceptible to rot to take any chances of spreading the disease among the Elbertas.

THINNING PEACHES.

For best results, whatever the peaches are grown for, it is always best to hand thin them early in the season before the seeds mature. By proper annual pruning, as described, the fruit will be much reduced in quantity, but this will not be sufficient. It will still be necessary to hand pick the peaches until those remaining are about six inches apart on the twigs. This is not theory, as the best and most successful fruit growers practice thinning in this manner, and they do so because they have found that it pays.

"16 TO 1," "6 TO 1" AND THE EGG-PRODUCING HEN.

"16 TO 1"—SHE EATS 16 TIMES HER OWN WEIGHT IN THE YEAR.

"6 TO 1"—HER EGGS IN THE YEAR ARE 6 TIMES HER OWN WEIGHT.

"16 TO 1"—HER EGGS BRING 16 CENTS PER POUND; HER FOOD COSTS ONE CENT PER POUND.

"6 TO 1"—HER YEARLY EGG PRODUCT IS WORTH 6 TIMES THE COST OF HER FOOD.

(T. E. Orr, Secretary of the American Poultry Association, Beaver, Penn.)

With my topic thus outlined no one will accuse me of talking politics or of discussing the relation of gold to silver; but the above is my text and I'm going to preach the "Gospel of Hen" and discuss the relation of feed to eggs and how to turn our farm products into cash at a good profit.

In doing this I shall try to give you an outline of the food supply necessary for carrying a flock of forty-five pullets one year and give the average cost of these foods and tell something of the relation they should bear to each other.

WHERE AND HOW OBTAINED.

A glance at the table found in this article shows that of the ten foods outlined six are found on nearly every farm. On most farms the other four must be purchased. But even if you are a villager and must purchase them all, you are simply carrying your merchandizing a little further than does the farmer, and the farmer and egg producer must both remember that if they are to succeed in this twentieth century they must be both merchants and manufacturers. As a merchant the farmer must buy his necessities for business at the lowest possible cost and then sell them in a somewhat different form at the highest obtainable price. As a manufacturer he is constantly converting the raw material into the finished product.

THREE COMMENTS ON OUR FOOD TABLE.

First. The foods are very largely cereal. I am a firm believer in the theory that the hen can subsist and yield a fine profit in eggs on a ration of grains alone. I have no objection to soft feed, cooked feed, steamed feed, etc., but it has been shown that these are not necessary to profitable egg production. You can probably increase the egg output for a short time by these expedients, but your yearly product will, we believe, not greatly exceed that from a grain and meat ration. By cooked or steamed feed you can surely increase the egg product at the time of year that eggs sell for the most money.

Second. I give this table of foods, not as the best one for all, but as a good one for most people, especially the amateur. If your market, location and surroundings enable you to substitute potatoes, turnips, beets, cabbage, etc., for some of the items, well and good; I have no quarrel with you and shall be glad to hear of your success through the columns of this paper. Or if you can obtain fresh bones from the butcher and will grind them, you can dispense with much of the cut-bone and beef-scrap I have prescribed and reduce materially the cost.

Third. You may not be able to purchase in small quantities the feeds I have prescribed at the prices named. Feed promises to be cheap this year and eggs will surely be high. This article is written in western Missouri, and a prominent stock feeder in looking over the table said, "You have those grain prices 50 per cent higher than is necessary for this section this year." Now, you may need to pay higher prices than those specified, but if so you are in a locality where you can sell your eggs higher than "16 cents per pound." At our Beaver Hill farm we believe that our feeds cost us perhaps 25 per cent higher than our estimate, but we will realize more than 25 per cent advance on the price of eggs, for at no time this summer did we sell eggs lower than 20 cents per dozen, and in September people were coaxing for our eggs at 24 cents per dozen, or "16 cents per pound." Right here in the country districts of western Missouri eggs are selling now for 18 cents per dozen.

THE PRACTICAL APPLICATION.

The problem I am asking you to demonstrate is the possibility of starting November 1 with forty-five pure-bred pullets of an "eggs-early-and-often" strain and on the rations I prescribe, or one of equal cost and merit, make them produce in 360 days 240 eggs each, "two eggs each three days."

CAN IT BE DONE?

There are many to rise and cry: "That's all theory; it can't be done." Well, such people are the ones who will also say "A hen can't possibly consume sixteen times her own weight in one year, no more than she can lay six times her weight of eggs in a year." Well, I'm not afraid of a calamity howler nor of the man who continually decries the theories of others but has no good practices of his own to present. Nearly twenty years ago the writer of this article experimented for a full year with one pen each of Brown Leghorns, Silver Wyandottes and Barred Plymouth Rocks. Our surroundings were very unfavorable, but those hens gave us then a product of 184 eggs, 172 eggs and 160 eggs per hen, in the order named, and convinced us that the hen to lay "two eggs every three days" was a coming reality. In 1890-91 we conducted an experiment with several different breeds, and the variety that stood second in our first test stood first this time, with 202 eggs to the credit of each hen.

MANY HAVE DONE IT.

In 1893 the writer of this article conducted an experiment participated in by 230 people. There were a few pens of grade and cross bred pullets, but most of them were pure bred and of the Standard varieties. Twenty different breeds were entered and ten different states were represented. One hundred and forty-three of these pens continued in the contest for the entire year and sent in their weekly and monthly reports on blanks furnished them. Many of these reports were verified by credible witnesses and attested by affidavits. Of these 143 full-year pens the twenty leading pens produced each an average of more than 200 eggs per hen, and the average of the total of these twenty pens was 240 eggs per hen.

When the above contest was started there were some poultry papers that predicted failure and disaster, but after it was completed in all its details their comment was favorable and several of the leading poultry journals devoted pages to publishing its particulars. Its results have been accepted as accurate and it has demonstrated clearly the ability of hens of several varieties to do just what we are urging you in this article to allow and help them to accomplish, namely: to produce 240 eggs per year of an average weight of two ounces, a total of thirty pounds, or six times the weight of the pullet at starting.

A UNIFORM EGG PRICE.

In the experiment above referred to the number and weight of the eggs were reported to us and we fixed the price by the average retail prices of eggs in Pittsburg for that month. The average price that year was 1 8-10 cents per egg, but prices were lower then than they have ever been since, so in our calculation in this article we are fixing the price at 2 cents per egg, or 16 cents per pound for two-ounce eggs, and as prices are sure to average considerably higher this year, we feel that we have taken a conservative position, both on the price of feed and on the price of eggs. A product of 240 eggs at 2 cents each gives an annual income of $4.80 per hen. In the above named experiment one pen reached an income of $5.02 per head at 1 8-10 cents per egg. So we are quite below the leading pen in our estimate for you, even at the advanced price.

LOW COST OF PRODUCTION.

We are now down to the question: Can we feed the hen on 80 cents per year, so as to come within the requirements of the fourth item of our text, namely: that her yearly cost for food is only one-sixth of the value of her yearly egg product? Again referring to that large experiment we must admit that the reports of those who kept account of food-cost ranged from 83 cents to $1.60 per hen per year, the average being about $1.20; but it must also be remembered that those people were competing for prizes for highest production, and but little attention was given to cheapness. Under those circumstances one would not hesitate to feed food costing 5 cents per pound, or even more, in order to make his favorites win.

SOME OTHER EXPERIMENTS.

Some two or three years ago one of our leading agricultural papers secured statistics showing that the farm hen costs for feed from 47 to 83 cents per year, an average of about 65 cents. But two objections arise here: First, these hens ran at large quite a portion of the time and picked up much of their food; second, these hens were not kept up to the high-pressure standard necessary to secure "two eggs every three days," so did not consume nearly so much feed as must your forty-five pullets in this experiment. Two ounces of grain per day is the highest estimate we have seen given, but we are sure from our own experience and that of others that this alone is not enough. We have, therefore, allotted to each of your forty-five pullets each weighing five pounds at the start, sixteen times her own weight of food, or a daily ration of three and five-ninths ounces.

A RICH RATION.

Even the critic will admit that this is a pretty rich diet—much better in both quantity and quality than he feeds—and we are ready to admit that it requires a hen with a good digestive apparatus to do the work. She must have the assimilating powers of the dairy-bred Jersey or Holstein cow to reach the mark. No dung-hills need apply. No drones need undertake the management. But it has been done; it is being done; you can do it if you will supply the comforts and conveniences that Madam Hen calls for. To consume ten and two-thirds ounces of food in three days and give you in return four ounces of egg is no small undertaking on her part, nor is it a small business on your part to secure it.

Remember one point just here: two-thirds of the egg is water. The remaining one-third you must give her in the proper solid foods, not forgetting the water, and also provide liberally at the same time for her animal heat, the wear and tear of her system and for the ashes of her animal fires. In other words, you must expect lots of your feed to find its way to the dropping-board, but even there it is a valuable product which we have not figured in.

COMMENTS ON THE FOODS.

A few words about these foods in the order named in our table:

Corn.—We use it in smaller proportion than here specified, partly because with us in western Pennsylvania it is very expensive, but more because it is too fattening. Our hens are kept for breeding as well as for egg production. The fat hen may be kept so and be made to lay eggs up to our requirements of "two eggs in three days," but the eggs from a fat hen do not hatch well.

Oats.—We consider oats our very best feed. Oats cost us 2 1-3 cents per pound the past season, but they are cheaper now. With an abundance of grit there is no danger in feeding whole oats. We bought hulled oats the past year for the same price as the whole oats. Fed alone, they are not satisfying to the hens. They do not furnish bulk enough. Hulled oats must be accompanied with plenty of clover and other coarse food.

Wheat.—At 80 cents per bushel the past season wheat was our cheapest feed. Don't think to economize by buying poor wheat or screenings. If you buy, buy the best quality obtainable.

Kaffir Corn and Sorghum.—These are two of the best of grains, as nearly a balance ration for the fowls as you can get; but don't depend on these or any other one grain. You must keep up the hen's appetite with variety. Skip from one grain to another frequently. Keep her happy and busy. It pays.

Bran.—We esteem bran as the one essential ground feed. We use it dry, in large flat boxes about the yards, where the birds young and old can jump in and pick a lot of it. We also use it as a basis of all our soft feeds, a carrier for our meat-meal, etc. We also use salt on our soft feeds. Bran is rich in protein; it is a good regulator; it seems to neutralize poisons.

Clover.—I take great care in harvesting my clover for poultry, both the first and second crop. It should be cut in good time, cured nicely without dew or rain on it, and may be stored in gunny sacks or otherwise until it is needed. We run it through the cutter and then wet or steam it over night, then add bran, meat, bone, salt, etc. Do not skimp the clover. Better waste some rather than that the hens should not have enough. Alfalfa is the only forage plant that approaches clover as "hen hay."

Meat.—The egg is rich in albumen. You must feed it into your hens or the eggs will be few in number and the whites will be thin and waterly. Granulated beef-scrap and the meat meal and dried blood are obtainable on the market. If you have an abundance of butchershop bones, and can obtain cheap meat to boil, thickening the soup with bran and vegetables, you are to be congratulated, provided you do this work regularly.

Grit.—This is the most essential grain feed. Without it your corn is of little good and your hens soon die of disease.

Use mica grit, pearl grit, gravel grit, cinder grit, any old grit, and, still better, all of them. Waste some grit to be sure you get enough grit.

Shell.—One-tenth of the shell is lime. Your egg shells must be heavy if you would hold a choice market. You can well afford to buy oyster shell at 75 cents per hundred pounds if you sell it at sixteen cents per pound, and that is what you do in the egg business.

Bone.—Every one admits that the growing animal requires bone-building material to give him strength of limb. Many, however, imagine that the hen old enough to lay eggs no longer needs this kind of supply. The hen, however, is the best judge, and the eagerness with which the laying hen will turn even from grain to pick up fresh cut bone or even dry bones, is the best evidence that she needs it in her business. Do not deny her this.

CONCLUSIONS AND SUGGESTIONS.

Now, here is the table of rations we suggest for feeding forty-five pullets 360 days. It fills the first condition of our text in that it gives each pullet sixteen times her own weight in feed. It fills the third condition of our text in that it can be obtained in most sections of the country at a cost of one cent per pound. It also fills the fourth condition of our text in that the cost of her feed is only one-sixth the value of her egg product. Do not condemn it until you have made an honest effort to realize the third condition of our text, namely: to make your pullets produce in eggs five times their own weight.

ONE YEAR'S FOOD SUPPLY FOR 45 PULLETS.

Three hundred pounds corn, at ⅝c. per pound	$1 87½
Six hundred pounds oats, at 1c. per pound	6 00
Four hundred pounds wheat, at 1c. per pound	4 00
Three hundred pounds Kaffir corn or sorghum, at ⅝c. per pound	1 87½
Four hundred pounds bran, at ¾c. per pound	3 00
Four hundred pounds clover, at ¾c. per pound	3 00
Three hundred pounds beef-scrap, meat-meal, dried blood, etc., at 2⅔c. per pound	8 00
Four hundred pounds grit and fine gravel, at ½c. per pound	2 00
Three hundred pounds oyster-shell, at ¾c. per pound	2 25
Two hundred pounds cut bone, at 2c. per pound	4 00
Total three thousand six hundred pounds, at a total cost of	$36 00

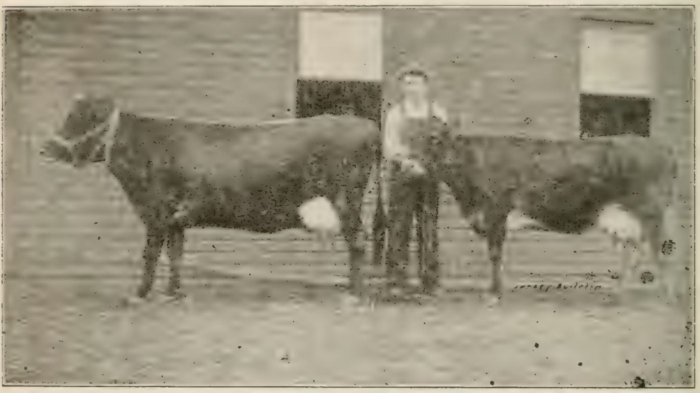
An average of eighty pounds of feed per hen, at a cost of eighty cents.

SILOS AND ENSILAGE.

(By Euclid N. Cobb, Monmouth, Illinois.)

My two week's work among the counties of Missouri the past fall were very pleasant weeks indeed. I met many old friends and I trust made many new ones. When Mr. Ellis wrote me asking me to assist in institute work he asked me to give silos and ensilage first place as subjects to bring before the dairymen and stock breeders of the State. This I was very glad to do, as I had been a resident of the State for some years and am well posted on the needs of the Missouri farmer, at least on how to get the greatest food value from the staple crop, corn. I am well aware that the bulk of the corn crop over the State as handled is fully one-half wasted, and the other half so fed that the full feeding value is not realized.

The chemical analysis of the corn plant or stalk shows a nutrient nearly equal to that of the ear, but when left to dry and bleach on the hill it is worse than wasted in many cases. It becomes a menace to every head of live stock that is allowed or forced to subsist on it. Those dairymen and stockmen who cut their stalks and shock them will find that they have a feed greatly relished by all kinds of farm stock, but they also find that they sustain a loss of from one-third to one-half of the fodder or the coarser parts. The chemist tells us that the nutritive value of the corn stalk decreases from butt to top, so that in the rejected part of the corn plant the greatest food value lies. The farmer who passes his corn through a shredder finds that he has put his fodder in a condition to be better consumed by his stock, and that he can make a large amount of best manure that is easily handled, but he is not fully satisfied.



Two of Mr. Cobb's Jerseys.

After fifteen year's use of ensilage with all kinds of farm stock I am fully convinced that the estimate is not too high, while the chemist finds no more nutriment in the fodder we put in the silo, old Brindle does, from the fact that she gets something she relishes and something that is more digestible than dry fodder or even green fodder. The digestive tests of some of our Experiment Stations have found silage is more digestible than any form of the corn plant either dry cured or cut green and fed. The greatest value of silage is in its succulent condition. It retains its juices and is partially cooked in the silo making it very palatable, and palatability of any of our farm fed crops is a great factor in producing results either in feed lots or dairy herd.

I append some figures obtained in our dairy herd for the past two years. The year 1900 being one of the dryest in the history of this section we found bluegrass completely burned up by July first, but with ensilage for succulent or green feed during July and August and September regardless of the extreme high temperature our daily milk yield was very satisfactory and regular. The following figures show sum total of the first day of July and the 15th, August first and the 15th, September first and the 15th and October 1st:

July 1st, 614 pounds, July 15th, 635 pounds.
August 1st, 628 pounds, August 15th, 638 pounds.
September 1st, 610 pounds, September 15th, 619 pounds.
October 1st, 631 pounds.

These results are as good as we were ever able to make with a herd of cows under any conditions. Please note results obtained during this past summer, with same herd on the best of bluegrass. I also append the statement of a friend of mine who fed 178 head of steers ensilage. This statement is as convincing as I ever read. This Mr. Jones is a thoroughly practical man. In a former letter Mr. Jones told me his cattle, the first sixty days, made gains that made him more profit from an acre of corn (the corn the poorest he ever raised) than he ever did from his best corn fed in the old way. Very few farmers realize the possibilities of an acre of corn or sorghum in the silo. An acre of corn fodder will feed a mature animal from three to four months, while the same acre in the silo will feed the same animal from 24 to 30 months. This fall we had ten acres of sorghum that in the silo will feed a cow or a two-year-old steer 40 months. There is not a farm in the corn belt of Missouri that is not capable of carrying a thousand pound animal on every acre of the farm. Does it do it now with hay and fodder?

SILAGE FOR STEERS.

We commenced feeding the 178 steers weighing on October 7 an average of 1,159 pounds. They were running on dry and exhausted pastures and were losing flesh, and on this account we commenced the feeding of the ensilage on the next day after we finished filling the silos, to wit, October 7, and gave them all they would eat after the end of the first week. The amount consumed during the first thirty days was 45 pounds per head per day. The cattle made an average gain of 55 pounds per head. They had no other feed but the ensilage and the dead grass, of which they ate very little. The second month we commenced feeding some shock corn along with the ensilage and gave the cattle about one-third of a full feed, as nearly as we could estimate it. This resulted in a reduced consumption of ensilage, and the cattle made a gain of 75 pounds per head during the second month.

During December and January the cattle were fed in the same way except that they were put up in dry lots, and we added some clover hay. The cattle ate of the hay about ten pounds per day per head.

We commenced selling the cattle about the 1st of February. They were sold at three different times.

The result during the whole feeding period, ranging from 120 to 150 days, was that the cattle made an average gain of 2¼ pounds per day, and consumed, estimating the ensilage to contain 10 per cent. of its weight in ear corn, less than one-half the amount of corn which we have always heretofore been compelled to feed like cattle in order to make that much gain.

I am greatly pleased with ensilage as a feed for fattening steers. In my judgment it doubles the net profit of the corn crop.

The cost of putting the corn in the silos was, with us, no more than the cost of putting it in shock, and one man could feed four times as many cattle from the silos as he could were he to haul the corn from the shock in the field in the ordinary way.

A part of this ensilage was a mixture of corn and soy beans, and from this we got better results than from the all-corn ensilage. We also carried through the winter about 300 head of 900-pound steers on the ensilage alone and they made very satisfactory gains and kept in much better condition than we had ever secured with stock cattle, wintered in the ordinary way with hay and fodder.

The best results in feeding of ensilage will be obtained by using it in connection with clover hay, soy beans, cow peas or some other food, rich in protein.

In my judgment an ideal food for fattening 1,000-pound steers would be all the clover hay and corn ensilage which they will eat, and about 15 pounds of corn per day or something less than one-half the grain they would eat if given nothing else, with a little oil meal added to the grain during the last month of the feeding.

With stock steers, yearlings and two's, an excellent feed is the corn ensilage and hay without any grain at all, and they will keep in fine condition and make satisfactory gains, and can be wintered much cheaper and better than under the old method of carrying stock cattle through the winter.

We are so well pleased with our experience in feeding ensilage to fattening cattle last winter that we are now finishing the construction of another silo, which will hold about 1,100 tons. This will give us a total ensilage capacity of about 22,600 tons, and we are expecting to carry through the winter at least 500 cattle with ensilage as the main ration.

We planted cow peas with corn this year, and will cut the corn and cow peas together, and we will also put into the silos some soy beans, mixing the same with alternate loads of corn. I am inclined to think that ensilage made of one-half corn and the other half soy beans or cow peas will so properly balance the feed as to require very little, if any, clover hay. Still, we shall expect to keep clover hay by our cattle all the time.

The silo we are now finishing is 36 feet inside diameter and 50 feet in height, and is built of cement, the wall being 12 inches thick. We have laid in the wall, 6 inches apart, ⅜-inch wire hoops. The cost will not exceed 80c per ton capacity, and the structure looks now as though it would last forever. The wall is as hard as stone. The material we used was Portland cement, sand and coarse gravel, the mixture being one part cement three of sand, and five of gravel. Our ordinary farm labor has erected the silo.

In my judgment the time is at hand when more economical methods of producing beef must be adopted, and the silo is, I think, the solution of the question. Under the old method of fattening cattle on shock corn nearly one-half the value of crop is wasted, and by using a corn ration alone the full benefit of the other half is not obtained.

The silo, clover and alfalfa, soy beans and cow peas, are, in my judgment, destined to work a revolution in methods of beef production.

Yours truly,
HUMPHREY JONES.

Ohio.

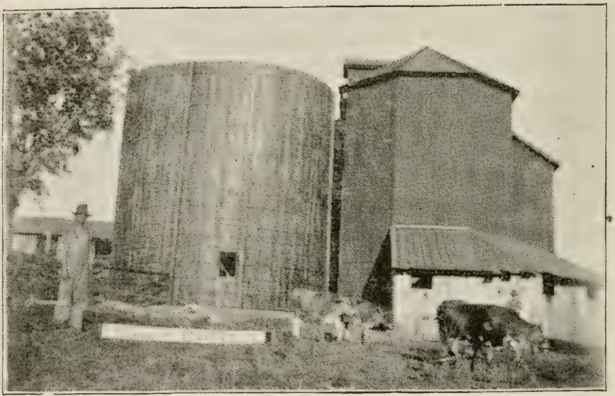
THE CONSTRUCTION OF THE SILO.

Fifteen year's use of silos and silage in several states and under various conditions of climate, has caused me to study both the construction of the silo and its filling. I find today that the greatest drawback to the adoption of the silo system is the supposed great cost of construction. I have used silos that cost $4 per ton capacity to construct and have used those that have cost 50 cents per ton capacity, and in one case content cost was as low as 30 cents. The cheap silo kept the silage just as well as those costing many times more money.

When we consider what constitutes a good silo, we have only three things to remember, good material, strength and, last, perfect exclusion of air after silo is filled. The first named, that is, good material, does not necessarily mean brick, stone, cedar, redwood or some other material that will cost a large sum both as to material and transportation, but something at hand, some local material, or material that is reasonable in price.

In building a silo, I consult local conditions. If in Texas, use Texas hard pine. If in western coast country, would use redwood or cedar, but in the central section of the United States I find nothing better than the ordinary 2x4's white pine of commerce. I have thoroughly tested this material in several states and in no case has it proved defective in any one of the above named qualifications—strength, durability and perfect exclusion of air together with simplicity of construction.

To build a round silo of 2x4 stuff, get your lumber and have it dry and free from loose knots; see that edges are straight, so that when walls are up, edges will touch evenly the entire height of silo. In a circle of 14 feet or more it is not necessary to bevel the lumber to fit the circle; it is better not to do so, because the lumber will dry out more quickly when the silage is removed, which tends to prolong the life of the silo by checking decay. In case beveling is done, don't bevel the entire stick's width, only take off bevel from center of timber. This will leave other half slightly separated from its mate, giving air a chance to dry wood.



Mr. Cobb's Silo.

To the novice an empty stave silo with its staves showing daylight shining through cracks from top to bottom is far from an airtight building, but one has only to tighten up hoops, snug and go ahead and fill. A stave silo is like a leaky barrel. It only wants hoops driven tight to make it as tight as ever. While the silo has not hot water, it has something just as effective—silage, which is 80 per cent. water or sap, and heats up to 160 degrees. Every crack is shut tight.

To build a stave silo, first decide on size of silo, then get the material most abundant in your locality. Any lumber that will not warp is suitable. Have it dry if possible. If your silo is to be above 20 feet in height, buy lumber of two lengths; for a 24-foot building get 14 and 10-foot stuff, for a 26-foot silo, 12 and 14-foot lengths. Get your stuff on the ground during some dry, hot days, laying it closely, like a floor. Then take an old broom or a whitewash brush and a bucket of coal tar (this is called gas tar and can be bought for 3 or 4 cents per gallon at gas works) and paint the lumber, not scrimping the amount. Let lay a day or so and then turn up another face of the lumber and again give it the gas tar paint. Continue until all sides and edges are painted. Gas tar is the best preservative of silo walls yet found, and I may add that for rough work, such as farm gates, corn cribs and board roofs, it is not equaled by many of our paints. If tar is too thick to spread easily, thin with gasoline, remedying any trouble of this character.

While our lumber is drying we will put in silo foundation. We must decide where to build, and the best rule is to build just as near the animals' mouths as possible, to save work when feeding; at gable end of barn or shed is the best place. To lay foundation, drive a peg in center of ground selected for foundation; take a fence board, bore a hole in end, slip over peg, then at half of distance of diameter of silo, slip a pin or bolt that will mark ground as board is moved around. After this mark is made, set pin out as far as width of foundation trench is to be, which is about 16 or 18 inches. Now dig trench 18 to 20 inches deep; then fill up within 6 inches of top with small rocks, brickbats or very coarse gravel. Over this pour thin cement. After this part of foundation is complete start wall 6 inches from outside of trench leaving a 6-inch jog. That jog is to fool any rat that may wish to explore contents of silo. He will dig down to the concrete work and then stop, not knowing enough to follow the 6-inch step to outside of concrete. It is better to finish the narrower wall with flat rock or brick. Build up 8 or 10 inches above level ground. The dirt should then be thrown up against wall on outside, even with top of wall to turn water from building.

The inside circle or silo bottom should be of dirt only. Many people put down costly cement floors, only to find that a large amount of silage is spoiled each year. We do not know the cause, but we know that the last foot or 8 inches of silage on cement has a very offensive smell and is not relished by cattle, while silage on dirt can be fed to the last basketful. I am speaking from 16 years' experience when I make this statement. Have fed from many cement bottoms, always with the same result.

A sill is not necessary, but I always use one. To make the sill, take 10-inch width lumber 1 inch thick and cut in segments, of circle of wall; cut enough of these to make sill three or four inches thick; bed first in layer of mortar, then give a coat of gas tar, then lay on another course, breaking joints; nail down to lower layer. Continue laying, tarring and nailing until desired thickness is reached. We are now ready for the tarred staves or 2x4's. But you may wonder how to make a start, what to use for fastening hoops and silo with, and what to fasten staging to. To do all of this requires four timbers of hard wood, 4 by 6 inches in size and as high as silo is to be. Before we put up these timbers, or we may say frame of our silo, we bore enough holes in these sticks to receive the hoops. These holes are in pairs, and are 2 1-2 inches from what will be the inside edge of silo. Holes are to be 3 inches apart, long way of timber. Now we will lay off our circle, finding one-quarter of distance, where we stand one of these sticks, the inside edge flush with inside wall of silo and becoming part of wall, and secure it by toe-nailing to sill. Then measuring another quarter distance set up another timber, continuing until we have the four up. We at same time brace these pieces well with fence boards or 2x4's, always keeping out of inside of silo.

After we have braced well, we set 2x4 pieces on outside of silo, opposite the 4x6 timbers, about 3 feet from them, or as wide as you wish to build scaffolding. Nail lumber from these 2x4's to 4x6 pieces at intervals of about 8 feet on which scaffold lumber is laid. A silo 25 feet high will require three of these stagings. Now we are ready to build or set up the staves. Three men, or boys, do first-rate. For this work the necessary tools are three hammers and plenty of 60-penny wire spikes; 40-penny will do in case 2x4's are scant 4 inches, as they often are. Now set up one of the 2x4's edge against a 4x6 piece and nail about every 4 feet; the men on different stagings will attend to nailing up to top of silo. Toe-nail the 2x4 stave to sill with 10-penny wire nails. Continue setting up and nailing. If the upper half of staves do not want to follow circle, strike on inside wall with heavy hammer, maul or back of an ax, and the right curve will come.

After setting all staves to last 3 or 4 feet (and this space should be at place where doors are to be), make arrangements for doors. The doors, are only the walls of the silo cut out on bevel, and the pieces thus cut out nailed together with some barrel staves, the staves giving the short pieces the necessary curve to circle. The bevel must be on inside of silo, so that when doors are set the silage will press them into place. No frames for doors are necessary and no fastenings or hinges. In cutting out the doors they should be numbered so they will be put in the same place each time. A door 20 inches by 2 feet is large enough. To cut out these places it is best to cut side bevel piece while the 2x4's are on the ground. To do this, bore a hole in center of the 2x4 on right bevel and cut with a tenant saw far enough to allow larger saw to enter cut; when piece is cut out, tack in place with some small nails. Now finish up silo walls, and then the man in silo will have to cut out the lower door in order to get out. If on outside, can cut his way in. Doors must be about 3 feet apart to be handy in taking out silage.

The hoops for this silo should be of five-eighths, round iron; each section of hoop should be long enough to pass through two of the 4x6 timbers, and threads should be cut 6 or 8 inches on each end of hoops so as to take up any shrinkage of silo. Large cast iron washers are necessary to bear against the 4x6. Light washers will sink into the wood when the silo is full and pressure bears on hoops. Hoops should be placed as follows: First, one near bottom of silo about 6 inches from sill; the next 2 feet higher, and each alternate hoop 6 inches higher than last put on. This is for 18, 20 and 25-foot in diameter silos; smaller ones may use fewer hoops and even one-half inch hoops will answer. Our silo is now ready for roof. The roof of silo can be built of boards put on hip roof style, or a cone-shaped roof can be put on and shingled. Metal roofing is used by many, while many have no roof. I have used silos without a roof and saw no bad results.

SOIL IMPROVEMENT.

(By Prof. R. W. Clothier, Cape Girardeau, Mo.)

Any discussion of soil improvement that attempts to enter into the scientific principles involved in the process must begin first with a study of the nature of soil physically and chemically.

PHYSICAL STRUCTURE AND CHEMICAL COMPOSITION.

The basis of all soils is ground rock. With this is mixed decayed vegetable and animal tissues, called humus, in varying proportions. All soils, then, whatever their nature and appearance, are composed of ground rock mixed with more or less humus. A mechanical analysis shows that the rock is ground to different degrees of fineness and some soils may be composed largely of the finest particles, while others are made up of the large particles. Clay soils are made up almost entirely of very fine particles, half of them being as small as .00004 inch in diameter. Sandy soils are composed of the largest soil particles. Loams are mixtures of clay and sand in varying proportions. It must be remembered that all of these classes of soils contain humus. There are, however, some soils that are composed almost entirely of humus and these are classed under the name humus soils.

Chemically, soils are made up of many compounds composed of various elements united in many ways. A discussion of these would lead us too far into the subject of chemistry for our present purpose, but it may be said that not all of these elements are necessary to plant life. There are about eight of the elements found in soils that seem to be essential to plant life. It follows then that the absence of any one of these would make a soil entirely unproductive.

But nature has abundantly supplied our soils with all of these elements but three, or possibly four, so that in our discussion we will consider only those elements likely to be found absent. They are nitrogen, potassium and phosphorous. One very prominent investigator says that soils may often be deficient in sulphur. Chemical analyses seem to bear him out in this view but until more data is obtained I shall confine myself to a discussion of only the three elements just named.

WHERE AND HOW FOUND.

Nitrogen is not strictly a part of the soil since all that is found therein was originally obtained from the air and in time will return again to the air, but since ordinary plants cannot use it except while it is temporarily a part of the soil we will consider it as one of the true elements of the soil.

There are three sources of soil nitrogen; These are humus, air in connection with certain bacteria and ammonia brought to the earth in rains.

Humus contains by far the greater part of the soil nitrogen, but in this form it is entirely unavailable to plants. The humus must be acted upon by several different species of bacteria which change its nitrogen through various forms finally into nitric acid which instantly combines with mineral matter of the soil forming compounds which we call nitrates. When a nitrate has been found the nitrogen in it may be used as food by plants. A soil without humus lacks potential nitrogen; a soil without bacteria will contain no nitrates; and a soil containing no nitrates cannot produce crops. Only a very small per cent. of the humus of a soil can be changed into nitrates during a single growing season.

The ammonia of the air is not a very important source of soil nitrogen when compared with the humus of the soil, but when compared with the needs of plants the nitrogen obtained from this source is of considerable moment. Ammonia is set free in various processes of decay and escapes into the air in the form of a gas. This rapidly dissolves in water and is brought back to the soil by rains. Bacteria then change it into nitrates. The amount of nitrogen obtained in this way varies in different localities. Measurements at various experiment stations have shown that an acre of soil may receive in a single season as much nitrogen as is found in from three to ten bushels of wheat.

The nitrogen obtained from "soil air" by the aid of certain bacteria is of very great importance. These bacteria are found in nodules that grow on the roots of certain plants belonging to the clover family. They extract nitrogen from the air and leave it in a form available to the host plant as food. Plants upon which such bacteria live are thus able to secure all the nitrogen they need from the air and this suggests a definite and never failing method of adding nitrogen to soils deficient in this element, which will be more fully discussed further on.

Potassium and phosphorous are found both in the humus and in the mineral matter of the soil, but chiefly in the mineral matter. They are spoken of as potash or potash salts and phosphoric acid or phosphates. When exhausted from a soil it is necessary to add mineral matter to replenish it.

AN INVENTORY OF THE SOIL.

But how much of these elements is found in soils and how does the amount compare with the amount removed by crops? We will let the chemist answer the question. I have before me a table giving the results of the analyses of forty-nine different soils selected from ten different states ranging from Canada to Alabama and from New York to Colorado.

The poorest one of these soils with respect to nitrogen contained 947 pounds of nitrogen per acre in the first foot of soil. The first foot contains about as much nitrogen as is found in the next three feet of soil, so in round numbers there would be 1900 pounds of nitrogen in the first four feet of soil, which represents the feeding field of the roots of our average farm crops. A yield of 25 bushels of wheat per acre requires 47 pounds of nitrogen for both grain and straw allowing a ton and a half of straw per acre. This farm would produce wheat at that rate only 40 years before all the nitrogen within the reach of plants would be exhausted, assuming that none would be wasted and that the wheat could extract all of the nitrogen from the soil. Neither of these assumptions is true, however, but we assume them to be true for the purpose of making comparisons. This soil would produce corn at the rate of 50 bushels per acre about half as long as it would produce wheat.

The richest soil found in our table contains about 27,000 pounds of nitrogen per acre in the first four feet. This would supply nitrogen for maximum crops of wheat 575 years and for maximum crops of corn 279 years. The average of the 49 soils analyzed contained nitrogen sufficient for 213 maximum crops of wheat and for 103 maximum crops of corn. The average of three Missouri soils selected from the table contains about the same amount of nitrogen as was found in the average of the 49 soils just given.

Comparing with respect to phosphoric acid we find that the poorest soil contained enough to produce maximum crops of wheat 60 years and maximum crops of corn 21 years. The richest soil would produce maximum crops of wheat 4659 years and maximum crops of corn 1635 years. The average of the 49 soils would produce wheat 633 years and corn 226 years. The average of the three Missouri soils would produce maximum crops of wheat 221 years and maximum crops of corn 81 years before all the phosphoric acid found within the reach of these plants would be exhausted.

Comparing in the same way with respect to potash, the poorest of the 49 soils contained enough of this element for 44 maximum crops of wheat and only 15 maximum crops of corn. The richest one would produce wheat over 9000 years and corn over 3000 years. The average would produce wheat 2500 years and corn nearly 1000 years. The average of the three Missouri soils would produce 25 bushels of wheat per acre 6000 years and 50 bushels of corn per acre 2100 years before the potash found within reach of the roots of these plants would be exhausted.

A recapitulation of the figures just presented will emphasize the following conclusions drawn from them: That some soils have been found in which some of the elements under discussion is practically exhausted. That in average soils the nitrogen will become exhausted by cropping much more quickly than the other elements. That in average soils all these elements exist in greater abundance than the average yield of crops would lead one to suppose. We must remember, however, that the chemist by his methods might be able to find large quantities of these elements present and yet they might be locked up in some form wholly unavailable to plants. The average soils of the United States have been under cultivation less than 100 years and yet our annual bill for fertilizers is now $60,000,000. Evidently farms do become poor with respect to crop production notwithstanding the large amount of the elements of fertility that chemists find in them. Statistics also show that the maximum crops upon which I have made the estimates just presented are not being produced. Let us try to find why this is true. It is evident that the quantity of plant food present does not necessarily determine the fertility of the soil. The quality must be considered and also the mechanical or physical condition of the soil, and the amount of water present.

IMPROVEMENT BY TILLAGE.

There is a constant tendency of the potash and phosphoric acid of soils to form compounds wholly insoluble or very difficultly soluble in water. Unless they can be dissolved by water they are of no avail as plant food. They are dissolved by acids of the soil and by secretions from the root hairs of the plant. The finer the soils are in texture the greater the surface they present to the action of these dissolving agents, and consequently the greater will be the amount of material dissolved. Thorough tillage breaks up the soil granules that are apt to be formed by the surface tension of water and so facilitates the solution of these two elements of plant food. It also helps to make nitrogen available by promoting the process of nitrification. Extensive co-operative experiments carried on by Cornell Experiment Station and the farmers of New York State have shown that the yield of potatoes can be increased by from twenty-five to fifty bushels to the acre by cultivating three or four times more during the season than is ordinarily done. Evidently plant food was liberated by the tillage, and this suggests a method of finding out whether the elements potassium and phosphorous are deficient in the soil or simply locked up in some insoluble compound where they are unavailable. We might often liberate these elements by tillage at a greater profit than supplying them by purchasing commercial fertilizers.

TILLAGE TO REGULATE MOISTURE.

Every farmer knows that his losses due to unreasonable water supply are far greater than those due to lack of fertility. Without water, plant food is unavailable no matter what the quantity or quality. Few of us realize the enormous quantities of water used by plants. The results of a few experiments along this line will help us to better understand the question of soil moisture. It has been shown that farm crops use an average of 325 tons of water for every ton of dry matter produced. Corn is somewhat below the average, so we will take it at 300 tons of water per ton of dry matter. A yield of 50 to 60 bushels of corn per acre would produce about four tons of dry matter. This would require 1200 tons of water, which is equivalent to 10.6 inches of rainfall. Experiments have shown that during 64 summer days in a fallow field there was an average daily evaporation of .67 pounds of water per square foot of surface. Should evaporation continue at this rate during the whole growing season of the corn crop, allowing 130 days as the length of this period, the total loss would be equivalent to 16.8 inches of rainfall. Adding this to the amount that must pass through the corn plant we have a total of 27.4 inches that must be supplied during the growing season to produce 50 to 60 bushels of corn per acre. To meet this enormous demand we have the water that has accumulated in the soil during the winter and the regular rainfall of the season. If the soil were completely saturated, the first five feet would contain about 20 inches of water. Not over half of this can be withdrawn by the plants. This leaves 17.4 inches that must be supplied by the summer rains. It is rare that the rainfall in our corn producing states during the months of May, June, July and August, is equivalent to this amount. We must therefore do everything possible to increase the storage capacity of the soil and to prevent loss by evaporation. Both can be accomplished to a certain extent by tillage. Deep fall plowing makes the soil porous thus allowing the water of the fall and winter rains to percolate down into the soil instead of running away into the streams and rivers, as much as it would otherwise do. The efficiency of a dust mulch in preventing evaporation is so well known that it need not be discussed here further than to say that the enormous loss above referred to can be reduced as much as 25 per cent. to 50 per cent. by surface tillage after each summer rain. There is room for the inventive genius of some American to give us an implement that will do this work quickly and cheaply.

IMPROVEMENT BY UNDERDRAINAGE.

I believe there is room for some very careful experiments along the line of underdrainage for the express purpose of removing air from the soil rapidly during heavy rains. Water enters soil by passing into the spaces between the soil particles. But these spaces are already occupied by air and this air must escape before the water can enter. Often rain falls so fast that the soil is covered with a sheet of water. The air must escape through this water and the process is a slow one. Meantime much of the water that is falling flows away into surface drainage ditches and streams. If underground outlets for the air could be provided it would pass out this way rapidly and the water would as rapidly follow it into the soil. In this way much water now annually lost by drainage would be utilized in the production of crops. Underdrainage and its value to lands injured by standing water is so well understood that it needs no discussion here.

IMPROVEMENT BY ADDING HUMUS.

I have spoken of tillage as a means of making potash and phosphoric acid soluble. The solubility of phosphoric acid also seems to be closely related to the amount of humus present in the soil. Professor Snyder of the Minnesota Experiment Station has shown that the soils rich in humus contain three times as much soluble phosphoric acid as those in which the percentage of humus is low. If we suspect that our soils are deficient in phosphoric acid it might be well to apply a good coating of barnyard manure and improve our method of tillage before buying bone meal. If good tillage and plenty of humus will not secure good crops it is then time to think of purchasing commercial fertilizers. Improvement of soils does not necessarily mean the addition of fertilizers as too many people are prone to believe is the case.

The restoration of humus to soils is the cheapest and best method of replenishing a diminished nitrogen supply. This may be accomplished by growing leguminous plants, the roots of which are allowed to decay in the soil, forming humus and adding nitrogen directly, since all the nitrogen found in them was obtained from the air. If the tops are removed however, it must be borne in mind that these plants remove large quantities of potash and phosphoric acid, and consequently the supply of these two elements may be rapidly depleted and even reduced to the danger point while the supply of nitrogen is being increased. They have one advantage however, in their deep root system which enables them to obtain these elements from depths in the soil below the feeding field of other plants. They must not, however, be considered a universal remedy for worn out soils. If they are used as a cover crop and the tops plowed under, they are then to add nitrogen in large quantities, while no potash or phosphoric acid would be removed.

Barnyard manure is a cheap and often neglected source of humus. It produces the best effect if thoroughly incorporated with the soil when it is wet and well rotted, but since by ordinary methods of handling, from one-half to two-thirds of it is lost by the time it becomes well rotted, farmers greatly in need of humus may haul out such manure as soon as it is formed and let it rot in the soil that needs it. There will be no bad results from this method where there is plenty of rainfall, but where there is a drouth during a portion of almost every summer, sometimes the presence of unrotted manure in the soil may increase the effects of the drouth. I have known this to occur, but the increased yields obtained for more than ten years after the application of the manure, much more than compensated for the loss incurred the first season.

In this connection it might be well to speak of losses of opportunities to add humus to soils incurred by burning corn fodder and wheat straw. A ton of corn-fodder contains three dollars' worth of nitrogen figured at prices charged for it in commercial fertilizers. A ton of wheat straw contains almost as much. When these substances are burned the nitrogen contained in them escapes into the air and can never be returned except by the use of leguminous plants. A man who rakes and burns corn stalks wastes at least sixty dollars' worth of nitrogen for every day that he works, to say nothing of the loss of other beneficial effects of the humus that might have been added to the soil by cutting the stalks and plowing them under.

Humus not only adds nitrogen, but it keeps the soil in a mellow condition which makes tillage easy and also allows water to percolate into the soil more rapidly and prevents puddling in rainy weather. One of the surest indications of deficiency in humus is a soft, sticky condition of the top soil during rainy weather, accompanied by a hard, baked condition during dry weather.

Humus also increases the capacity of the soil to absorb and retain moisture, thus aiding much to secure the presence of that large supply of water we have seen to be necessary for crop production. A single instance will illustrate this fact.

During the extreme drouth of 1901 it became my duty to determine the moisture in the soil of about thirty different fields upon which various crops were growing. Among them were two orchard soils. One had the following treatment: Late in the previous fall twenty loads of barnyard manure to the acre were applied and the manure plowed under and then thoroughly disced into the soil. Rye was then sown and this was plowed under early in the spring. The soil was disced after each heavy rain until the rains stopped falling during the latter part of April. This orchard was on upland soil. The other orchard was on first class bottom soil but had not had any application of manure and was not tilled after the rains. At the close of an unbroken period of 90 days drouth the soil that had the application of manure and the tillage, contained 16½ per cent. of moisture while the unmanured and untilled soil contained only 9½ per cent. of moisture. This difference in moisture content will appear more striking when compared with the condition of crops growing on soils of similar moisture content. In every case, on the very best of soil, corn was dead and dry enough to burn where the moisture had fallen as low as 8½ per cent. On clay soil it was dead at 11½ per cent. of moisture. When the moisture in the soil is between 16 per cent. and 20 per cent. we have the best conditions for growing crops. Of course the tillage of the soil greatly affected the difference in the moisture content of these soils, but the humus must certainly be credited with a large share of it.

THE USE OF COVER CROPS.

Cover crops may be used to prevent waste of fertility. Nitrates will leach out of a soil if not used by plants soon after they are formed. It has been shown at the Minnesota Experiment Station that in eight years of continuous cropping to wheat fully eight times as much nitrogen was lost from the soil as was removed by the wheat. It must have been leached out during the warm summer months when nitrification was most active, but after the wheat crop had matured. Cover crops will take up nitrates and thus prevent their loss by leaching.

IMPROVEMENT BY ROTATION OF CROPS.

Crops vary in their demands upon the soil, some removing much more fertility than others. They also vary in their feeding habits, some removing large quantities of one element while others remove large quantities of another element. These differences are especially well marked when considering equal quantities of the crops, but are not so marked when we compare the maximum yields of the various crops. Still even then there are differences and we may often prevent a particularly heavy drain upon one element by introducing a crop that removes less of that element and more of another. The advantage to be gained in this way is not so great, however, as it is commonly believed to be. Plants vary in their ability to feed upon the soil and often a great advantage can be gained by introducing a plant in the rotation which can extract plant food from soil upon which another plant might not be able to feed. By far the greatest advantage in rotation of crops consists in the opportunity it affords of growing leguminous plants upon all the cultivated portion of the farm. All farm crops with the exception of the legumes are extremely hard on the nitrogen of the soil when maximum yields are considered and so any system of farming which rests the soil with respect to nitrogen will prolong the producing power of the soil. When a part of the farm is used for pasture it is of great advantage to rotate the pasture land from one field to another. Very little fertility is removed from pasture land, the animals returning to the soil nearly all the fertility required to produce the grass upon which they feed, so the land is given a rest by putting it in pasture.

IMPROVING SOIL BY CHANGE OF BUSINESS.

If we follow the history of the development of new soils in the United States we will find that at first they have been devoted to grain raising for the markets, but that this system of farming gradually gives way to one in which stock raising predominates. A moment's consideration of the composition of the grains will explain why this is true. A bushel of wheat removes 20 cents worth of fertility from the soil, figured at the prices we pay for the elements removed when we buy commercial fertilizers. A bushel of corn removes about 19 cents worth of fertility. At 25 bushels per acre wheat removes $5.00 worth of fertility in the grain and about the same amount in the straw. At 50 bushels per acre corn removes $9.68 worth of fertility in the grain and $10.68 in the fodder, or more than $20 per acre in the corn and fodder. When land is new and responds readily to tillage there may be a profit in growing these grains for sale where labor only is considered, but there comes a time sooner or later when such farming ceases to be profitable even from a labor standpoint and men are driven into stock raising or else out of the business of farming entirely. Dairying is the most highly specialized branch of stock raising with respect to the fertility of the soil. By selling soil in the form of corn or wheat we obtain about .15 cents per pound for it, but by selling it in the form of butter fat we may obtain from $75 to $90 per pound for it. While an average Missouri soil would produce 25 bushels of wheat per acre worth $15. for only 213 years, it would produce 100 pounds of butter per acre worth at least $20. for over 50,000 years before its fertility would be exhausted. By engaging in the dairy business and hauling out all barnyard manure, a completely worn out farm may be made highly productive if the feed for the animals the first two or three years is purchased and a system of rotation of crops is adopted in which clover, alfalfa and cow peas play a prominent part.

IMPROVEMENT BY MEANS OF COMMERCIAL FERTILIZERS.

There is no doubt that where quick returns must be secured and the crops being on the market at the proper time determines its value, commercial fertilizers may be used at a profit. It may also often be true that the returns secured by the application of commercial fertilizers are more profitable than equal returns secured by an increased amount of tillage. As stated elsewhere in this article, when potash or phosphoric acid are exhausted there is practically no other way of replenishing the supply except by the use of commercial fertilizers.

From my conversation with farmers in this State while out on institute work, I am convinced that there are many localities in Missouri where the supply of phosphoric acid is either down to the danger line or else it is locked up in the soil and cannot be set free on account of a deficiency of humus. Such soils respond readily to a phosphate fertilizer. But the user of commercial fertilizers who relies solely upon this as a means of soil improvement will be a loser in the end. There will come a time when the price of the fertilizer will far over-balance the value of the returns from it, for it requires more and more each year to keep up the standard of production. Plants cannot obtain food even from fertilizers unless they have a well developed root system. They can have such a root system only when growing in a mellow soil and permanent mellowness is secured only by means of humus. These are facts that should be constantly kept in mind by the farmer who begins the use of commercial fertilizers.

ANTITOXIN AND VACCINE.

(By Dr. A. J. Detweiler, Bacteriologist and Sanitary Chemist of the State Board of Health.)

Just at this time a discussion of these two subjects is of great importance. I believe that the prejudice against the use of vaccine and antitoxin results from a lack of knowledge of their nature. Believing this to be the case I shall briefly explain their nature in order that the farmers may know why we expect good results in their use. I shall have to explain what we mean by a contagious or infectious disease, and the resulting immunity, before you will be able to understand what we mean by artificial immunity.

A contagious or infectious disease is a disease contracted from a previous case of the same disease. Thus the disease spreads from one inindividual to another, or from one animal to another. The ease with which contagious or infectious diseases spread from individual to individual varies in different contagious or infectious diseases, and hence the terms contagious and infectious. At one time a disease that spread only on contact with a previous case was known as a contagious disease. A disease contracted even when at a distance from a diseased body was formerly known as an infectious disease. Thus we see that one infectious disease might lead to hundreds or thousands of other cases. If this be true the cause of the disease must be something capable of growth. Thus reasoning we were led to believe that infectious or contagious diseases must be caused by some living cause, capable of growth and reproduction. This was believed long before we had any means of exact demonstration. Now we have discovered by means of the microscope and other scientific means that disease is caused by parasites belonging both to the animal and vegetable kingdoms.

Only a few of our infectious diseases are caused by animal parasites such as malaria, Texas fever among cattle, etc. However, there is a good reason for believing that smallpox is also caused by a parasite which will be classed in the animal kingdom. Of course these parasites are of a very low form of life, being unicellular. Most of our infectious diseases are caused by very low forms classed in the vegetable kingdom. Most of them are very small, so small that you might lay 25,000 of them side by side and thus cover only one inch of space. Some are even smaller than this. They are of various shapes and sizes, some round, others oblong, rod shaped, corkscrew shaped, etc. Almost eight hundred different forms of bacteria have been described. Many would also cause disease to plants and animals.

Bacteria are extremely small one-celled vegetable organisms, containing no chlorophyll and multiplying by division. For a long time it was not known just why bacteria produced disease. Now in nearly all cases we know that disease is caused by a specific poison which the germ produces during its growth and disintegration. A living cell secretes and excretes certain substances. When the cell is destroyed certain other substances may be liberated. Now if these substances happen to be poisonous or harmful to a human body and should gain admission to a human body a disease would arise in this body. Suppose the typhoid germ should gain admission to your body, and should multiply in your body, and during its multiplication these little germs should secrete or excrete a poison harmful to your body you would then suffer from typhoid fever. You would not develop typhoid fever until sufficient poison was produced to distinctly interfere with your vital processes. Thus the dose of poison which would be harmful to you might not injure me and I go unharmed. Now we know these things to be facts. We know that these different forms of disease germs secrete distinct and different forms of poison, for we can isolate these poisons and demonstrate them on animals. In fact we can measure them out in doses just like you would strychnine or any other powerful poison. However we connot get them entirely pure.

The poisons from a particular disease germ will produce the same disease if the poisons are given in a sufficient dose, that is, produced by the living germ itself. There is this difference, however, if one use only the poison and not the living germ, of course the disease will not spread, for the poison itself cannot grow any more than strychnine can grow of itself. Thus you see that in most infectious diseases in order for one to recover from such a disease he must be able to resist the poisons produced. The mere presence of the very small bacteria would do no great harm in themselves, but it is the poisons which they produce. There are some apparent exceptions but we will not discuss that here.

Some of these poisons are fatal in extremely small doses, even in impure form for we have not been able to purify them. Thus Brieger and Cohn found that 0.000,000,05 grains of impure tetanus or lockjaw poison was sufficient to kill a mouse 15 grams in weight. Expressed in terms so that you may understand it, 1-300 of a grain would kill a man of average weight. Now a drop of water weighs one grain, hence, a dose equal to 1-300 of the weight of a drop of water would kill a man, or a dose equal in weight to a drop of water would be sufficient to kill three hundred men. Thus you can understand why some of these diseases are so fatal.

When a patient suffering from an infectious disease like diphtheria and untreated by a doctor recovers it is because his system was able to build up in it, a substance which neutralized or destroyed the poison produced by the diphtheria germ. When the poison is neutralized the weapon of the germ is taken away and it becomes harmless like a great many of the harmless germs which we find all around us. Now if we take the diphtheria poison and inject it into a horse in the proper amount we will make the horse sick, but if we do not give him too much he will recover. The next time after he has fully recovered we inject a larger dose and he recovers again. We keep on increasing the dose until we have injected a very large amount. Now if we draw off some of the horse's blood and allow it to clot, we shall find that in the straw colored fluid which is squeezed out of the clot a substance which neutralizes or destroys the poison from the diphtheria germ. Thus we can take different doses of diphtheria poison and find out just how large a dose is required to kill a guinea pig of a certain weight. After having discovered the minimum fatal dose for a guinea pig we take ten times this fatal dose and inject it into a guinea pig. Of course this would mean certain death to the guinea pig. However at the same time we inject a small quantity of this horse's blood serum previously mentioned along with this diphtheria poison. We thus experiment on a large number of guinea pigs until we discover exactly how much of the horse blood serum is required to neutralize ten times the fatal dose for a guinea pig of a certain weight. When the poison is exactly neutralized the guinea pig should not get sick at all. Now a horse thus prepared so that his blood will neutralize or distroy diphtheria poison contains antitoxin in his blood. Therefore diphtheria antitoxin is this horse blood serum placed in small vials and sold to the physicians. Enough horse blood serum to exactly neutralize one hundred times the fatal dose for one guinea pig or to save the lives of one hundred guinea pigs each receiving a fatal dose of the poison is called an "immunity unit." Now you see vials on the market which contain 2000 or even 3000 units of diphtheria antitoxin. Just think what this means. It means that there is sufficient antitoxin in a 3000 unit bottle to save the lives of 3000 times 100 or 300,000 guinea pigs, each receiving a fatal dose of poison. This is not theory, for the only way one can know how many units a vial contains, or the strength of the antitoxin is by actual experiments with that antitoxin in guinea pigs. Thus you see why the antitoxin saves the life of your child, when it may be necessary to inject enough antitoxin into that child which would neutralize enough poison to kill 300,000 guinea pigs. The child may contain much more poison than would be required to kill 300,000 guinea pigs. How could you expect it to live unless you could succeed in destroying this poison? This you can do with antitoxin, and this alone.

Now we will discuss vaccine. You are all aware that human beings do not contract certain diseases which attack your stock. These human beings are said to be naturally immune to those diseases which they do not contract even when exposed to them. You are also aware that a certain number of men may be exposed to an infectious disease, some may contract that disease while others escape. Thus several men may drink water containing typhoid germs, only a few of them may contract the disease. Now those who do not contract the typhoid fever may escape because they are immune to that disease. There are various ways in which we can explain this immunity but we will not discuss that here.

I have previously stated that when an individual recovers from an infectious disease unaided by a physician, it is because his system has built up in it something by means of which it protects itself from the harmful effects of the poison of that disease. After recovery this something which saved him from the harmful effects of the poison of the disease remains in his system for a long time. It may remain in his system for a life time or only a few months. If it remains in his system for a life time he will not again contract the same disease, if it remains there only a short time he may contract the same disease when exposed again. We find different conditions in different diseases and have to explain this immunity in different ways, but this is the general law. An immunity acquired by having had the disease is known as "acquired immunity." You all know that when one has once had smallpox he is not liable to have it again, because his system has built up in it something which renders the poison of smallpox harmless, and hence the cause of smallpox can in no way harm the body again.

Before going further I wish to say that the immunity of the body in general is greatly influenced by the care we take of our bodies. Thus a man exposes himself to rain and cold and then contracts pneumonia. The rain and cold lowers the resistance of his body and then the germ of pneumonia takes hold and immediately begins to manufacture its poisons. The same thing applies to the proper feeding and exercise of the body, as is well shown in animal experiments.

We all know that epidemics of diseases vary in virulence from time to time. We also know that when a disease first gets a foothold in a country it gradually increases in virulence. We find by experiments in our laboratories that most of our disease germs can be increased or decreased at will in their poisoning properties, their virulence. Thus suppose I decrease the poisoning powers of the blackleg germ, and now inject it into a calf, the calf does not die but recovers because the germ could not secrete enough strong poison to kill it. Now, however, if the calf becomes infected with the virulent germ of blackleg after it has recovered from the milder one, it will not now die, because its system has built up something to destroy the poison of the milder germ. In doing this, however, the system of the calf has fortified itself so that when the more virulent germ attacks it, it can now successfully cope with the more virulent poison and does not sicken at all. There are many ways in which we can decrease the virulence of a germ and then use it for vaccination.

You all know what is known as smallpox vaccine is now obtained from cows. Formerly we obtained it from the arms of human beings. According to the best experimental evidence thus far obtained cowpox is smallpox of the human being modified in virulence by being passed through the cow. It was formerly traced to a disease among horses known as "grease." Therefore, cowpox is smallpox made mild by passing it through the cow. Now the vesicles from the belly of a cow which is inoculated with cowpox yields our vaccine. The sterilized ivory points are dipped into the matter scooped from the vesicles of a cow with cow-pox, or it is mixed with glycerine and sealed up in little glass tubes.

Now, when one is vaccinated his arm is inoculated with cowpox or modified smallpox. The disease is so mild that one has only a slightly sore arm. As in the case of the calf with the blackleg vaccine, so in the case of the human being after being vaccinated. His system in resisting the mild poison of the vaccine has so fortified itself that it can now fight the real virulent smallpox when exposed. Something has been produced in his system which neutralizes or destroys the poisons of smallpox. This fortifying substance built up in the body as a result of vaccination may last only a few months or it may last a life time. One cannot tell. The only safe rule is to be vaccinated every time one is exposed to smallpox. Even twenty-four hours after exposure to smallpox vaccination will save one from the disease. When vaccination is localized on the skin the immunity is produced so rapidly that the poison of smallpox is overcome before it can be generated in sufficient quantity to cause smallpox.

The sore arm is caused by uncleanliness. If the proper care is taken by the doctor and patient during and after the vaccination there should be no sore arm. The sore arm is due to an infection. If all of our people were properly vaccinated there would be no smallpox.

THE CANNING INDUSTRY.

(By Hon. N. F. Murray, Oregon, Mo.)

The art of canning provisions to preserve them is of comparatively recent date. As early as 1810 Augustus de Heine took out a patent in England for preserving food in tin or other metal cases by simply exhausting the air by means of an air pump, but it was unsuccessful. It was followed by a number of others by various persons, all of which were more or less failures, until Werthermer's patents, "three in number," which dated from 1839 to 1841. On this foundation the canning industry has been built up, and from time to time new improvements have been added, till at present it is one of the great industries of the country.

For a time canning was mainly confined to the eastern states, but of late years it has spread to a considerable extent throughout the western states, having made a phenomenal growth in California.

The assets of the California Fruit Canners' Association are $5,525,483. The association last year worked up 56,851 tons of fruit and vegetables and 5,908,147 pounds of sugar were used in the process. A large amount of the fruit and vegetables canned are grown upon land worth from $200 up to $1,000 per acre and shipped thousands of miles to market, and they may be found in every grocery of our country. Last fall orders were placed with the California canners for three hundred car loads of canned tomatoes to supply Missouri and adjoining states. We have no complaints to make against the people of California for the strenuous efforts they are putting forth to supply the world with their products, but we have a right to ask our own people of Missouri, why do we not grow and can our own products to supply our own people and retain our money at home, in place of continually paying it out to build up great commercial centers in distant states?

We have the land. At least fifteen millions of acres of Missouri is the finest and best fruit and vegetable land in the world. Our fruits have always taken first awards at all the great world's expositions. This land can be bought for $5 up to $100 per acre, and it needs no irrigation. It is near railroads and in a State that has a fine home market among her three millions of people, one-half of whom live in towns and cities. With all these great natural and superior advantages, why has Missouri not engaged more extensively in the canning industry? Simply because of the fact that Missouri is a State so highly favored with such a variety of crops and such a wonderfully diversified industry that her people "do not have to go to market with their eggs all in one basket," as they do in some sections. Our people may select any one of forty or more industries from which they can make a living by only a reasonable effort. One-half or more of our farmers are bank depositors, and having large, rich, fertile farms stocked with fine herds, making money easily, and living in luxury they give but little thought or concern to "side issues" such as canning fruits and vegetables, and why should they? I have frequently heard farmers at the close of a farmers' institute, where they had listened for hours to able lectures on the profits of dairying, fruit-growing, canning, etc., remark that such things might pay very well, but they did not care to bother with them and did not have to. And to all such we say, very well, continue on and give close attention to your farm crops and to your herds. In the very nature of things our broad acres will in the future, as in the past, be largely devoted to farm crops and live stock, and we are justly proud of the record we are making in agriculture; but we have many sections in the vicinity of our large towns and cities where labor is plenty, well suited to the growing and canning of fruits and vegetables. We are doing a little, but might increase this industry ten fold without detracting an iota from our general farm and stock operations.

Twenty years ago we began to urge and advocate the starting up of canning plants in Holt county and twelve years ago a company was organized at Oregon, Missouri, and a plant put in at a cost of $8,000. It has run every year and made money. One year the profits were over $5,000, but the great benefit resulting from the plant is the fact that it each year scatters twelve to fifteen thousand dollars in our little town and the immediate vicinity, that goes largely into the pockets of the poorer classes of our citizens and enables them to pay their living expenses. The goods of this plant took the gold medal at the World's Columbian Exposition held at Chicago, for the best canned corn and tomatoes, and it has never been any trouble to sell the entire pack at good prices.

A few years ago another canning plant was put in at Forest City, Holt county, Missouri, by Allen Brothers, of Omaha, at a cost of $7,000, with a capacity of twenty thousand cans per day. They have paid out for corn, fruit, vegetables and labor fifteen to twenty thousand dollars per year, and have made good money, and now talk of enlarging the plant to keep up with the increasing demand for their goods. These two plants are only three miles apart and have beyond a doubt added much to the wealth and prosperity of the respective communities where located, and that, too, without detracting anything from other industries. Much of the sweet corn and tomatoes are grown by people who have small acreages and in young orchards, and no better crops can be grown than in the young orchard, as the needed cultivation for the corn and tomatoes gives the young trees the cultivation necessary to secure a fine, thrifty growth.

From our experience and observation in the business, we can say that the canning industry, if properly gone into, with the plant well located and made up of the latest up-to-date machinery and run on business principles, will pay the investors ten to fifteen per cent on their capital, and in addition will prove a blessing to the community where located.

We have no interest in selling canning plant machinery, or anything pertaining to what we have said in this article. We have retired from the nursery business and are now engaged in commercial fruit growing. In all public matters it is our desire and ambition to see our great State move forward and excel in all of the great and growing industries for which nature has so eminently endowed her. Hence we aim to give you the benefit of our life time experience in fruit growing, vegetable gardening and the canning industry.

It is only a matter of time until we must turn our attention to the intensive culture of the soil, rather than the extensive, in order to feed and clothe the teeming millions of the world's rapidly increasing population. We need have no fear of an over-production of canned goods. They will keep and are always in demand and may with safety be shipped to the world's most distant markets.

It will be well for any community desiring to embark in the canning industry to first have some competent and disinterested person to look over their location, examine their lands and pass upon the crops that may be grown successfully, and on all other points relating to the business.

SOME NOTES FROM EUROPEAN HORTICULTURE.

(By J. C. Whitten, Horticulturist Experiment Station, Columbia, Mo.)

The American horticulturist in Europe cannot fail to be struck by the difference between their methods and ours. Their methods are intensive, ours are extensive. They bestow much labor and extreme care upon the individual plant, while we give less care to the individual in order to produce plants in large quantities. Theirs is a horticultural retail business, while we grow by wholesale. The German particularly grows a variety of fruits, ripening at different times, in order to secure a succession; we grow few varieties in large quantity in order to supply a large amount for a single shipment. Commercially then American horticulture far outstrips European horticulture. They have nothing which compares in magnitude to our large American orchards. With the possible exception of their extensive vineyards in the wine districts, they have no very large areas planted to a single kind of fruit.

Perhaps it can not be said, however, that the German, for example, is less well supplied with fruit than is the American. He plants many kinds, from the early strawberry to the late apple, and also plants many varieties of each fruit in order that a little may be produced for market each day. We plant large areas to a single variety in order to market a large quantity at a time. The German markets locally in small quantity. He sells each apple, for instance, just when it is ready to be eaten. With him seldom a day passes without bringing to perfection its quota of delicious fruit.

Horticulture in Germany partakes more of the nature of gardening than of commercial orcharding, as we understand it in America. Their fruit trees are largely planted along the road sides, thus serving also as ornamental shade trees. When planted as an orchard in private grounds, the space under the trees is usually planted as a garden to small fruits and flowers.

The Germans also practice fancy or ornamental methods of training and pruning their fruit trees. Often the fruit trees are trained fan-shape against the garden wall or on trellises like vines. Espaliered trees border the garden walks or artificially formed specimens occupy central points in the garden. Everywhere the gardening feature predominates. Fruit trees are pruned with great care and trained in artificial shapes so that a few specimens furnish occupation for a person.

They prune in summer and in winter. Summer pruning consists of shortening wood growth or in turning it into unusual directions to induce the formation of fruit buds and to admit air and light. Winter pruning consists of distributing the branches over the desired space, of thinning the fruit buds to the required number and of shortening the rank wood growth so as to keep the tree symmetrical. The American orchardist could not make a living putting so much labor on a single tree.

All available space in their plantation is utilized. Under the standard trees are planted the dwarfs or small varieties like the Quince. The space between these smaller trees is filled with currants, gooseberries, small fruits and flowers, so that all the ground is occupied. With the painstaking care which is given abundant fruit buds are usually secured. By thinning the fruit spurs and the fruit itself, the trees are prevented from overbearing and their uniform vigor is so kept up that off years are not so prevalent as they are in America.

The German takes great pains to put his fruit on the market in small attractive packages, just when it is ready to be eaten, and he secures prices for the best grades such as we have never dreamed of getting in America. Even the apples are not all picked from the tree at the same time. The early ripening specimens are taken from the tree first and several subsequent pickings are made, so that each specimen is gathered when it is in just the right stage of development. The fruit is stored in cool cellars and as soon as a few specimens are ripe, they are attactively packed, two to half a dozen in a basket, and put on the market so that they reach the consumer on the day when they are at their best. They say that perishable fruits, like the pear and peach, are at their best stage for eating only for a period of about twenty-four hours and that the most delicious stage of the apple does not last for a much longer period. If fruit is put on the market a day or two too early or too late, it does not please the customer who eats it, and consequently the price must be low, while if marketed at just the right time, choice specimens will bring the highest prices. The difference between a first class specimen of fruit and an ordinary one is greater in Europe than it is in America.

They claim that different varieties of the same kind of fruit ripen best at different temperatures; some sorts need a temperature of 38 to 40 degrees, while others are improved by being subjected to a temperature slightly below freezing. In a general way, early ripening sorts are best if subjected to the higher temperature, and the long-keeping, firm sorts need the lower temperature to bring out their best flavor.

The poorest specimens of fruit are usually canned or preserved at home. Everywhere one sees apparatus for preserving surplus fruit on a small scale. Germans are much better supplied with jellies, marmalade, preserves, wine, etc., than are Americans. On account of using low grade fruit in this way, a part of the product is carried over to those seasons when green fruit is not plentiful and better prices are secured for the green fruit in its season.

While the intensive methods of the German gardeners might not be directly adapted to our American conditions, the principles involved in placing only the best upon the market so as to create a demand for high priced fruit, are worthy of our consideration.

THE FARMER'S LIBRARY.

(By William D. McKee, Polo, Mo.)

There are three general sources by which we gain knowledge, viz.: by conversation, by listening to lectures and by reading. The student of the Agricultural College has the opportunity of availing himself of all of these, but with the average farmer it is different. He must rely largely upon reading. Sir Francis Bacon said that "reading maketh a full man," and it has been said by a distinguished educator that there are two kinds of educated persons, the one who knows much and the one who knows where to find much. I am not one who would claim or argue that the farmer to be successful should be a classical scholar or one deeply versed in scientific knowledge, yet I do maintain that he should have a well selected library made up of the works of practical men who have written well upon the topics which are of vital interest to the farmer. I do not enter upon the task of writing these observations upon the importance of every farmer providing himself with an abundance of wholesome literature relating to his life work, ignorant of the prejudice which exists among a large number of farmers against what they call "book farmers" or "book farming."

This prejudice, I am glad to say, is fast fading out, however just may have been the cause for it in the past. There was a time when books on farming of a very impractical character found their way into the farmers' homes, and possibly a few books and agricultural papers of this class are being issued and published today. But that is no reason for denouncing them all. The American farmers of today are a reading and a thinking class of men, more so than those of any other country. They are also able to discern what to read as well as to be able to intelligently apply the principles set out in what they read.

Those who have critically examined the recent works upon farming will, I think, agree with me in pronouncing them to be intensely practical and compiled by men noted for their broad knowledge of the subjects upon which they have written. These works and publications are usually full of such information as the farmer is greatly in need of and at times absolutely necessary in order that he may successfully prosecute the operations of farming. There are various sources from which the farmer may obtain literature, such as the publications of the agricultural press, books, and the publications of the State and National government. The agricultural papers are today giving the farmer some very valuable reading matter and I feel no hesitancy in urging every farmer to subscribe for one or more of these journals.

If his work is along a special line, as dairying or poultry raising, he will have no trouble in finding periodicals published by specialists in his line. Or if his work be that of general farming, such as stock raising and the growing of crops, he can easily find good and reliable publications edited by men who are or have been successful farmers.

I now come to that part of this paper that should interest every farmer who has not provided for himself a library. I refer to the publications published by the State and National government. These publications are compiled by men who are wholly free from bias and in every way eminently qualified to write upon these subjects. These are for the most part sent free, and when a price is charged, it is merely the cost of publication. They cover most every conceivable phase of farming and are issued in book and pamphlet form. Those to be had in book form are the Year Book and other prints of the United States Department of Agriculture, and the annual reports of the various State boards of agriculture. Those to be had in pamphlet form and possibly the most interesting and useful to the farmer are the Farmers' Bulletins issued by the United States Department of Agriculture and the experiment stations of the different states.

Now as this is written in part as a guide to farmers who are desirous of collecting books and publications for a farmer's library, I will give what in my judgment are some of the many books and publications that are worthy a place in every farmer's library. No farmer's library would be considered complete without such text books as "The Soil," by King; "Fertility of the Soil," by Roberts; "Animal Breeding," by Miles; "Horse Breeding," by Saunders; "Feeds and Feeding," by Henry; "Veterinary Adviser," by Laws; "The Domestic Sheep," by Henry Stewart; "Swine Husbandry," by Coburn; "Judging Live Stock," by Craig; "Poultry Farming," by Felch; "Principles of Vegetable Gardening," by Bailey; "Principles of Fruit Growing," by Bailey; "Bush Fruits," by Fred Card; "Fruit Harvesting and Marketing," by Waugh; "Insects and Insecticides," by Weed; "Strawberry Culture," by Fuller. I would include in this list on Horticulture, the Annual Reports of the State Horticultural Society.

Among the publications of the State and National government I would recomend the annual reports and bulletins of the different States and the Year Book and Farmers' Bulletins of the department at Washington, D. C.; also the Special Report on the Diseases of the Horse and the Diseases of Cattle by the Bureau of Animal Industry at Washington. By writing to the Superintendent of Documents, Union Building, Washington, D. C., you will receive a list from which you can obtain for the asking, free, such Farmres' Bulletins as "The Feeding of Farm Animals," "Hog Cholera and Swine Plague," "Silos and Silage," "Potato Culture," "Care and Feeding of Fowls," "Barnyard Manure," "Kaffir Corn," "Essentials in Beef Production," "Conformation of Beef and Dairy Cattle," "Cow Peas," "Rotation of Crops," etc.

By a careful observance of the suggestions set out in this article, any farmer, at a very small outlay of money, can provide for himself a library in every way adequate to the demands of the average farmer.

EXPERIMENTS IN CATTLE FEEDING.

(Written for the annual meeting of the "American Federation of Agricultural Students," held in Chicago, December 2, 1902, by Jas. N. Price, Student in Agriculture, University of Missouri.)

Since cattle feeding has come to be one of the most important industries in the United States, the question of how to produce the cheapest beef has become one of great importance to the feeder. A great many experiments have been conducted along this line by the experiment stations of the different states with some excellent results, showing the relative values of the different grains and hays as well as the value of shelter for cattle on full feed and the comparative values of summer and winter feeding. But, after all these experiments and the many bulletins published and papers written on this subject of cattle feeding, many farmers still say that the old way is good enough for them; and continue to feed cattle for market on corn and timothy hay.

The Missouri Experimental Station has carried on a number of experiments in cattle feeding with some interesting and valuable results. One of the most interesting of these experiments was conducted for the purpose of testing the relative values of different kinds of roughness for cattle feeding. The first trial was made with three lots of four two-year-old steers, each full fed on shelled corn. The first lot was fed timothy hay for roughness, the second cow pea hay, and the third clover hay and corn fodder with the following results:

Lot.	Corn.	Roughness.	Daily gain per steer.	Gain per bu. of corn.
Corn and timothy hay	166 bu.	3,813 lbs.	1.69 lbs.	4.87 lbs.
Corn and cowpea hay	188 bu.	3,662 lbs.	2.64 lbs.	6.74 lbs.
Clover hay	....	1,626 lbs.	....	....
Corn and corn fodder	185 bu.	1,889 lbs.	1.94 lbs.	4.96 lbs.

It is shown by these results that the clover and corn fodder lot ate 19 bushels more corn than the timothy hay lot, but on the other hand they ate 298 pounds less roughness and gained 0.25 pound more per day per steer, and made 0.11 pound more gain per bushel of corn than the lot fed on timothy hay.

The cow pea hay lot ate 22 bushels more corn; a little less roughness; and gained 1.78 pounds more per bushel of corn and made a daily gain of 0.95 pound more per steer than the timothy hay lot.

The second trial was made with four steers in each lot as before with practically the same results, as is shown by the following table:

	Bushels of corn.	Pounds of roughness.	Daily gain per steer.	Lbs. of gain per bu. corn.
Corn and timothy hay	157.5	2,540	1.97	5.00
Corn and clover hay	176.2	4,768	2.84	6.44
Corn and cow pea hay	175.3	4,783	2.84	6.47
Clover hay	....	2,475	....	....
Corn and corn fodder	176.2	868	2.85	6.74
Clover hay	....	2,967	....	....
Corn and wheat straw	169.0	1,139	2.68	6.65

Through some mistake the clover hay and corn fodder lot were allowed all the clover hay they would eat and consequently they made clover about three-fourth of their roughness; yet the gains serve to show the great value of clover for feeding cattle on full feed. The results of the experiments show that all the lots, which received clover hay or cow pea hay for all or part of their roughness, ate a little more corn than the timothy hay lot, but in every case they made better daily gains; and the gain per bushel of corn was from 1.08 pound for clover hay and wheat straw to 1.74 pound for the clover hay and corn fodder lot more than for the timothy hay lot.

These experiments show the importance of feeding a balanced ration. Notice that when corn and timothy hay were fed together the daily gain per steer was only 1.97 pounds and that a bushel of corn produced only 5 pounds gain. But, however, when clover was fed instead of timothy the average daily gain per steer was 2.84 pounds, and a bushel of corn produced 6.44 pounds of gain or practically a pound and a half in favor of clover hay. With beef at five cents per pound this means that the feeder would get about seven and a half cents per bushel more for his corn by feeding clover instead of timothy.

It is of importance to note that not only did the clover and cow pea hay give more rapid and much cheaper gains, but the steers fed on these hays showed a much better coat and far more finish than those fed on timothy hay, and would have easily outsold them on the market. Even when corn fodder and wheat straw was fed with either clover or cow pea hay the effect upon the quality and appearance of the steer was as marked as the gain.

RATIONS FOR WINTERING YEARLING STEERS.

Since practically every farmer winters at least a few cattle and comparatively only a few men finish cattle for market, the Missouri Station decided to carry on a series of experiments to determine the best roughness for wintering steers without grain or on half feed. The trials were made with four yearling steers in each lot, and corn and timothy hay were again taken as the standard ration.

The results of the first experiment were briefly as follows:

The lot fed on	Daily gain per steer—lbs.
Timothy hay, etc., 28 bu. of corn	.64
Clover hay and corn fodder, 28 bu. of corn	.88
Cow pea hay, 28 bu. of corn	1.54
Cow pea hay, no corn	.56

One of the most striking results of this experiment is the excellent gains obtained by feeding cow pea hay. It will be noticed that when fed with 28 bushels of corn the average daily gain per steer was 1.54 pound as compared with 0.64 pound when timothy hay and corn was fed. Even when fed alone, without any grain at all, the average daily gain per steer was only 0.08 pound less than when 28 bushels of corn was fed with timothy hay.

The second trial was made with the same class of cattle. Each steer was fed six pounds of corn per day which amounted to 34.4 bushels of corn for each lot during the experiment. The gains were as follows:

Roughness.	Gains per day per steer.
Timothy hay	1.00 pound.
Clover hay	2.00 "
Millet hay	0.37 "
Sorghum hay	0.52 "
Clover hay and corn fodder	1.35 "

As in other trials clover fed alone or with corn fodder gave excellent results. The surprising feature of this experiment is the very poor showing made by millet and sorghum even when compared with timothy. Although there seems to be no reason for doubting the accuracy of these results, yet the station managers hardly feel safe to reach definite conclusions as to the feeding values of these hays from the results of a single experiment.

INFLUENCE OF SHELTER ON GAIN OF STEERS.

A series of experiments have been carried on to test the value of a warm shelter for feeding purposes. The results were as follows:

(1) Two lots, one in a barn and one in open shed. The open shed lot ate 14½ bushels more corn and one-fourth ton more hay and gained 0.25 pound more per day per steer than the lot in the barn.

(2) Three lots were used; one in the barn, one in open shed and one in open lot. Those in open shed ate 19½ bushels more corn and a little less hay and gained 245 lbs., or a daily gain per steer of 0.45 pound, more than those in the barn. Those in the open lot ate the same amount of corn and hay as those in the barn and gained 240 pounds, or 0.44 pound per day per steer, more.

(3) In this trial those in the open lot ate one bushel less corn and one-fifth of a ton more hay than the lot in the barn and gained 8 pounds, or a daily gain per steer of 0.2 pound, more. Those in the open lot ate seven bushels less corn and the same amount of hay and gained 42 pounds more than those in the barn, which shows a daily gain of 0.11 pound more per day per steer.

(4) In this trial the steers in the open shed ate 13 bushels more corn and 0.22 ton more hay and gained 60 pounds, or a daily gain per

steer of 0.14 pound, more than those in the barn. Those in the open lot ate 31 bushels more corn and 0.73 ton more hay and gained 107 pounds, a daily gain per steer of 0.26 pound more than the lot fed in the barn.

It will be noticed that in the last two trials the steers in the open lot made better gains than even those fed in the open shed; and, while they ate more in the last trial, in the third they ate less than the open shed lot.

In these experiments the steers in the barn were kept in a reasonably tight but well ventilated barn with a plank floor and were allowed to run loose. They were kept well bedded. During pleasant weather they were allowed the run of a well drained lot from 8 o'clock in the morning to 4 o'clock in the afternoon. They were turned into the lot for water every day, but in stormy weather were put back in barn as soon as they were watered.

The open shed was closed on the north, east and west and open on the south. It had a dirt floor which was kept well bedded to keep it as dry as possible. This shed opened into a lot of about the same size as the one used for those in the barn. The steers were fed and watered in the shed, but had free access to the lot in all kinds of weather.

For those which were fed in the open lot some corn stalks were thrown in one corner of the lot to give them a dry place to lie.

All these trials gave practically the same results. While the difference in gains in open shed and open lot show no marked difference in favor of the open shed, yet from all results it seems fair to say that when much winter feeding is done it is profitable to furnish a suitable shelter for the cattle for their feed, and particularly to give them a dry place on which to lie. But from the results of the experiments it does not seem profitable to try to make this shelter warm.

Not being satisfied with these results the station manager decided to ask the opinion of the leading feeders of Missouri, Iowa, Illinois and Nebraska. They found that out of 663 feeders, 117, or 17.6 per cent, preferred barn; 392, or 59 per cent, preferred open shed; 154, or 23.2 per cent, preferred open lot.

Notice that over one-half preferred the open shed. It is interesting to note also that many of those who preferred a barn described the kind of a barn they used and it was practically little more than an open shed. So it was found that the experience of practical feeders verifies the result of the experiment.

It must be remembered, however, that the cattle in this experiment were on full feed which produced a great deal of animal heat. This same experiment was carried on with yearling steers; during one winter, feeding hay only, and the other three winters feeding a small amount of corn and all the timothy hay they would eat; and the results were greatly in favor of the barn.

SUMMER AND WINTER FEEDING.

Since the practice of the most experienced feeders tends towards summer feeding, the Missouri Station decided to inquire into the matter; and on sending an inquiry to a large number of the leading feeders of Missouri and some neighboring states found that less than ten per cent of the practical feeders were in favor of winter feeding, while fifty-one per cent were in favor of summer feeding, and forty per cent favored either spring and summer, summer and fall, or spring and fall. To learn more of the practice of these men another inquiry was made asking if winter feeding had been found profitable and if they still practiced it. Only 372 answered "Yes," while 441 answered "No," showing that 54 per cent had discontinued winter feeding.

Then in order to get the relative gains of cattle on full feed in summer and winter the station sent out this question: "What is your average daily gain per steer on full feed?" In answer to this question the following was received from three states:

IN WINTER.

Missouri, average daily gain	2.11 pounds.
Iowa, average daily gain	2.32 "
Illinois, average daily gain	2.18 "
Average	2.20 pounds.

IN SUMMER.

Missouri, average daily gain	2.90 pounds.
Iowa, average daily gain	2.80 "
Illinois, average daily gain	2.84 "
Average	2.85 pounds.

This shows a gain of 0.65 pound per day per steer in favor of summer feeding.

The results of experiments carried on at the Missouri Station with regard to summer and winter feeding are of interest here.

Taking the results of the experiments during five years on winter feeding, which are, in point of feed used, age of cattle, and other conditions, fairly comparable to the summer feeding we learn that the average daily consumption of roughness in winter feeding was 3.15 pounds per steer. Then at $5.00 per ton it cost 61 cents monthly per steer for roughness; 73 cents at $6.00 per ton; and 88 cents at $7.00 per ton.

These cattle weighed about 1,000 pounds when placed on experiment; and around Columbia pasture may be had at from 60 cents to $1.00 per month for such cattle on full feed. Hence it is fair to say that the cost of roughness will about balance the cost of pasture, thus bringing the problem down to a comparison of the number of pounds of grain required to make a pound of beef under the two systems of feeding and the relative amounts of labor involved.

It was found that ten pounds of grain made a pound of beef in winter (as an average gain of all the experiments) and that a bushel of corn produced 5.6 pounds of beef. In summer on grass 7.19 pounds of corn made a pound of gain, or a gain of 7.7 pounds per bushel of corn; a difference of a little more than 28 per cent in favor of summer feeding. It was found also that the average daily gain in winter was 2.13 pounds per steer, while in summer it was 2.56 pounds—a difference of 0.43 pound in favor of summer feeding.

Besides obtaining the better gains in summer feeding the labor is much less than in winter since the handling of roughness is eliminated. and in most cases the cattle are fed only once a day—either early in the morning or preferably in the evening after sunset.

From the experience of a great number of veteran feeders, and from the results of the station experiments, it is shown without doubt that the spring and fall seasons are very much better times for securing good gains at small expense than winter with its sudden changes and extreme cold or midsummer with its heat and flies. But unfortunately these seasons are not long enough to allow a steer to be finished properly without either beginning in winter or feeding through summer heat. The reports received from the leading feeders show that they try to overcome this difficulty to some extent by conducting their feeding so that they are able to finish their cattle in spring or fall instead of winter or midsummer.

Cattle feeding is, as it is generally conducted, one of the sources of greatest loss on the farm; while if it is properly conducted becomes one of the most profitable branches of agricultural industries. Indeed it is deserving of close study and careful practice.

TUBERCULOSIS OF THE DAIRY COW.

(By Dr. Sesco Stewart, Kansas City Veterinary College.)

A few years ago Dr. Edward Rush, of New York, became interested in the study of tuberculosis and after patient investigation as to the extent and prevalence of this disease he found that in every country where tuberculosis prevailed among the people it was also prevalent among the cattle used for dairy purposes. He found also that where milk and butter were not used as a food, the people were not afflicted with tuberculosis. Of the cattle slaughtered in Prussia a recent report shows that 14.6 per cent were tuberculous; in Saxony the percentage found was 29.3; in Belgium 20,850 cattle were tested in 1896 and 48.88 per cent were found to be afflicted with this disease. An eminent authority in England estimates that 30 per cent of the cows of that country are tuberculous. In the New England states the percentage of tuberculous cows is probably not nearly so great, yet the number is relatively large. Under the direction of the cattle commission of Massachusetts, over 24,000 dairy cows were tested, 50 per cent of which were found to be tuberculous. These cattle were in the worst infected counties. The dairies maintained by several of the states, at the agricultural college farms, hospitals for the insane and other state institutions, have been tested and in almost every instance an alarming percentage of tuberculous cows have been found.

Of the cows shipped from the territory west of the Missouri river to Omaha, St. Joseph and Kansas City for slaughter, many are found to be diseased with tuberculosis, hence it is fair to believe that the dairies of Missouri are not free from this malady. A consideration of this subject at the present time may be helpful in drawing particular attention to the nature and characteristics of this disease and lead to the prevention of its extensive development throughout the dairy districts of this State.

Tuberculosis as a disease is not confined to cattle but prevails among all animals, domesticated or wild. Even fowls and fishes contract the disease.

An animal body is composed of cells or unit elements arranged in groups and tissues, and these into masses or organs, such as mucous membrane, lungs, liver, muscles, bones and skin. The cells of which flesh and bone are made up are cemented together into tissues and organs, and in channels formed everywhere through these tissues and organs in which flow streams of fluid that contain large numbers of loose cells. These loose cells under certain conditions can wedge their way between the fixed tissue cells.

The germ causing tuberculosis is very much smaller than either the loose cells floating in the body, or the fixed cells constituting the tissues, and when once it has found entrance into an animal body it can penetrate between the tissue cells. This little germ, the bacillus tuberculosis, finds its way into the animal body through various channels, and is able to make use of the tissues in which it becomes lodged, as food for growth and multiplication in numbers. Strange as it may seem, this germ is able to grow in any tissue of the animal body, hence it sets up diseased processes in the lungs, liver, glands, muscles, skin, and even the bones. The development of the germs in any tissue produces an irritation at that point and the tissue undertakes to protect itself from further encroachment by building a wall round about the invaders. Loose cells accumulate in an effort to surround the disease germs causing a thickening of the tissues and a heaping up as it were into a little hillock or nodule. Such a nodule is spoken of as a tubercle, hence this disease is called tuberculosis. The colony of germs within the tubercle secrete a poisonous substance which causes the death of the layers of cells next to them and while the tubercle is continuously strengthened on the outside it is destroyed on the inner side. The dead elements of the enclosing wall are converted into a cheesy mass having a white or yellowish white color, while the outer surface of the tubercle may be either gray or pink in color, depending somewhat on the place in which it develops. These tubercles vary in size from a pin head to a pea, and when growing upon a serous membrane they have a gray or pearly color and constitute the old time "pearl disease" of cattle. These tubercles may grow close together and accumulate in masses as large as a walnut, a man's fist, or even larger than this. When the disease process has developed slowly the cheesy centers of the tubercles contain gritty particles of lime salts. Sometimes they coalesce, run together and the dead cells become one large cheesy mass.

If you are examining the carcass of a cow and should find tubercles such as have been described, and by cutting them open you find the centers are made up of cheesy, gritty masses, you will know that they are the lesions of tuberculosis. The parts of the body in which these tubercles are found are rarely the seats of other diseases producing like lesions, hence there is little chance of being mistaken.

Tuberculosis spreads among dairy cattle quite slowly when they are not housed, but when stabled and fed from a common manger, the discharges from the lungs, coughed out by a cow on the hay, manger or floor, are swallowed with the food by the cows in the stanchions next to the afflicted one, or those down the line in the direction in which the hay is pushed along the manger. A calf suckling a tuberculous cow is quite likely to contract the disease because tuberculosis germs escape from the body through the udder with the milk. The mucus coughed up by a cow and which lodges upon the manger or walls of the enclosure may become dried into a powder and be blown about in the air, and in this way breathed into the lungs by healthy cattle, there to set up the disease.

This disease develops very slowly, it requiring weeks and months for it to reach a stage at which any symptoms are produced recognizable by the ordinary observer. When the disease is contracted by the animal breathing the germs into the lungs, the first symptom is a cough which gradually becomes more and more frequent. Coughing spells are brought on by exertion, such as getting up after having lain for a time, running, or by drinking freely of cold water. If the infection occurred through swallowing the virus, often the first symptom is that of indigestion with bloating, and diarrhoea alternating with constipation. After the disease has progressed farther and interferes with the functions of one or more vital organs the animal begins to lose in flesh and shrink in milk, if giving milk, and all the symptoms increase in severity until the animal is destroyed or dies of the disease. No matter in what organ the disease first starts, it will ultimately spread to all parts of the body.

When it develops in the udder, it is recognized by the formation of rounded masses here and there in one or more quarters. Sometimes a number of such masses, varying in size from a hazelnut to a walnut, are so close together as to appear, when handled, as one nodular painless mass. The quarters in which large masses develop usually give a thin watery milk which is very noticeable when compared with that of the other quarters.

It behooves every dairyman to be alert and not permit any diseased animal to become a part of his herd. When such a one is found he should dispose of it and protect his herd from contamination. The cow which has a persistent cough or diarrhoea, or continues to become unthrifty under the same treatment that others maintained a fair condition, or one in which nodular masses develop in the udder should be at once separated from the herd. If it does not seem desirable to dispose of that animal at once, it should be kept apart from the others and watched for further developments. When a herd once becomes infected with tuberculosis, it will not long remain a profitable herd. The loss from death and from shrinkage in quantity of milk and physical condition of the animals is quite sure to take away the profits.

There is yet another factor to be considered, the milk from a tuberculous cow when fed to pigs will give the disease to these animals. It is customary among dairymen and feeders of cattle to haul the carcass of a cow or steer that dies to a place where the swine may feed upon it, for the well established reason that raw flesh serves as change of diet and stimulates to greater thriftness. If such animal has died of tuberculosis, the swine which feed upon it are quite likely to contract the disease and prove not only a loss of the animals directly involved, but also spread contagion to others.

The carcass of a tuberculous animal may be rendered serviceable as food for swine if it is thoroughly cooked, and the milk from a tuberculous cow may be rendered harmless by boiling. Such cooking and boiling destroys the tubercular germs, but does not destroy the food value of the milk or flesh.

In a former statement your attention was called to the relative prevalence of tuberculosis in cattle and mankind. This close association of the disease is a clinical fact which must impress every thinking man regardless of any theories which may be promulgated. Tuberculosis in man is spoken of as the "great white plague," and surely it is for more than 10 per cent of all the deaths in human kind, where statistics are kept, is accredited to this disease. It is possible that in large per cent of cases the disease is communicated from one person to another, by cohabitation and the lack of care in promptly rendering inert the spittle of the consumptive. That the milk from tuberculous cows is another source of infection will not be doubted by those who have investigated the large number of instances in which children and adults have died of this disease and in which instances tuberculous cows were the only discoverable source of infection. I feel confident that no Missouri dairyman would for a moment consent to permit the milk of a tuberculous cow to be used as food in his own family or to be sold for food to other persons if he realized the great danger from the use of such milk.

Many eastern dairymen whose herds were infected, have weeded out all the infected animals, have disinfected their stables and inclosures, and rejuvenated their herds by adding only cows which were free from tuberculosis. This weeding out process and procuring animals free from this disease, has been accomplished by the use of tuberculin as a testing agent. By this agent it is possible to detect tuberculous animals which give no outward signs of the disease, and makes quite certain the diagnosis in cases where the symptoms are not well marked, yet the disease be suspected because the animals have been exposed to infection. This plan has been thoroughly tested and proven effective, and I commend it to you as a means of protecting the lives of your families and customers and conserving your finances through prevention of loss of your animals and their products.

PROFITABLE PIG FEEDING.

(By Col. G. W. Waters, Canton, Mo.)

The pig makes by far the greatest amount of gain for the food consumed of all of our meat producing animals. Dr. Warrington, in "Chemistry of the Farm," states that for each one hundred pounds of feed consumed the gains are: "Cattle 9 lbs., sheep 11 lbs., pigs., 23 lbs." or pigs make nearly two and a half times as much gain from a given amount of feed as do cattle. But to state the matter more concisely, analyses show upon the average that for every one hundred pounds of the digested nutrients consumed cattle gain 12.7 lbs., sheep 14.3 lbs., and pigs 29.2 lbs. It may be suggested here that when prices are anything like the same it is a vastly more profitable use of feed to produce pork than beef. But of course there is a place for cattle as there are many varieties of feeds suited for cattle that pigs cannot use.

It is worthy of thought, however, to try to broaden the uses of our feeds for pigs, for they will use profitably many of our feeds that we do not think of, as we shall see as we proceed. By properly preparing them there are many of our coarser feeds that may be fed to pigs, and in this way not only secure an increased amount of gain but at the same time the pigs will have a greater variety of feeds, thus securing better health and thrift. Lest some of you should doubt the accuracy of Dr. Warrington's statement as to the comparative gains made by cattle and hogs from a given amount of feed, I call your attention to the following tables:

COST OF GAIN IN HOGS AND CATTLE COMPARED.

Table I. Pigs—Cost of Gain—Rate of Gain—Numerous Stations.

Number of stations reporting.	Whole No. fed at all stations.	Average weight of pigs, lbs.	Feed given daily, lbs.	Gain per day, lbs.	Feed required for 100 lbs. gain.	Gain per bushel, lbs.
41	174	38	2.23	.76	293	19
100	417	78	3.35	.83	400	14
119	495	128	4.79	1.10	437	13
107	489	174	5.91	1.24	482	11.6
72	300	226	6.57	1.33	498	11.4
46	223	271	7.40	1.46	511	10.1
19	105	320	7.50	1.40	537	10.

Table II. Cattle—Cost of Gain Compared with Pigs.

Station.	Kind of cattle.	Av. age at beginning	Av. weight at beginning	Days fed	Feed for 100 lbs. gain.	
					Corn, lbs.	Hay, lbs.
Kansas	126 heifer calves	7 months	408	210	503	508, alfalfa
Kansas	4 steers	26 months	900	56	730	Alfalfa daily
Kansas	4 steers, same lot	26 months	900	140	910	Alfalfa daily
Kansas	4 steers, same lot	26 months	900	182	1,000	Alfalfa daily
Missouri	4 steers, yearlings	20 months	813	80	605	1,420, timothy
Missouri	4 steers, yearlings	20 months	900	80	300	909, clover
Missouri	4 2-year old steers	31 months	1,150	119	1,140	470, timothy
Missouri	4 2-year old steers	31 months	1,197	119	837	220, cow pea hay

In Table I the fact that gains are uniformly made for less expenditure on young animals than on older and larger ones is clearly shown. A great many experiment stations have tested this matter, and in the table is shown that pigs weighing 25 to 50 pounds make a gain of 100 pounds for a little over one-half the amount of grain required to make the same gains on pigs weighing 300 pounds and over. The same principle holds good in cattle feeding. Referring to Table II, you notice the cheapest gains are on calves and the most expensive on the large steers. But the purpose of introducing the table on cattle feeding is to make the comparison of cost of putting on gain as between cattle and pigs. The cheapest gain made on pigs, average of 41 trials of different stations, averages 293 pounds of grain, not necessarily corn in every case, but as a rule a balanced ration was fed. Compare this with some of the cheapest gains made by cattle. In the case of the calves reported by the Kansas Station it is claimed to be the cheapest production of baby beef on record, yet it took 503 pounds of corn plus 508 pounds of alfalfa hay to produce 100 pounds of gain, amounting to at least the equivalent of 750 pounds of grain such as was fed to the pigs. Look through the tables and you will find the general testimony verifies the statement as to the productive uses the pig makes of his feed. Take the highest requirement for the pig at the weight of 320 pounds, viz., 537 pounds; compare with the requirement of the large beef steer, viz., 1,140 pounds of grain plus 470 pounds of timothy hay, equal to a total of at least 1,300 pounds of grain, such as was given to the pig to produce 100 pounds of gain.

CHEAPENING PORK PRODUCTION.

But the main problem that confronts us now is how may we cheapen production of pork? Or, in other words, and more directly stated, how may we make the feeds we give our pigs more efficient? More productive? As between some methods of feeding and management and other methods there is a difference of ten, twenty or even fifty per cent in the yield. If by judicious feeding we could increase the efficiency of our feeds by ten per cent, it would mean a vastly increased output from a given crop. Secretary Ellis, from reliable sources estimates the yield of our corn, hay, fodders and all feed crops in the State in 1902 at the vast sum of $200,000,000. Two-thirds of this ought to go into live stock. A ten per cent increase in the efficiency of this feed would mean $13,000,000 more to the farmers.

It is our purpose to discuss some of the conditions under which our feeds may be more efficiently used in the production of pork.

GIVE A VARIETY OF FEEDS.

Pigs do better on a variety of feeds than on any single feed. This is a principle of universal application in all classes of stock feeding. This proposition is well understood by the farmers, but still it is ignored so completely that we think it well to give it some emphasis. Just how much better the pig will do if fed a variety, we will let the pig himself testify, for whatever other mean thing a pig may do, he will not tell a lie. The following are some of the results. Many other tests have been made, all pointing to results much the same.

Table III. Single Food vs. Variety—Wisconsin Station—Five Lots, 4 in Each Lot.

Lot.	Kind of feed.	Amount required for 100 lbs. gain.
I	Corn alone, required for 100 lbs. gain	537 lbs.
II	Middlings alone, required for 100 lbs. gain	522 lbs.
III	½ corn and ½ middlings	439 lbs.
IV	½ corn and ½ oats	429 lbs.
V	Corn plus clover hay	422 lbs.

It will be observed that by combining shorts and corn half and half there was a saving of nearly 100 lbs. of the mixture in producing 100 lbs. of gain. By the use of one-half oats and one-half corn more than 100 pounds was saved. By the use of a little clover hay, over two bushels of corn was saved in producing 100 pounds of gain. At that rate clover hay would take the place of five bushels of corn in bringing a hog up to 250 lbs., marketable size. How is the clover hay fed? Better probably to chaff it in cutting box, dampen it or steam it, but it may be fed dry in racks. The Montana Experiment Station found that alfalfa fed in racks, and corn, gave better results than alfalfa cut and wetted and meal added. The Nevada Station found results in feeding three lots of pigs, carefully selected for uniformity, four in each lot on alfalfa hay and other combinations as follows:

Lot.	Pigs.	Weight—Lbs.	Days fed.	Kind of feed.	Average Gain or Loss.
I	4	131 to 150	21	Alfalfa hay	Loss, 4.5 lbs.
II	4	130 to 149	21	Alfalfa and turnips.............	Gain, 1.7 lbs.
III	4	132 to 147	21	Alfalfa, cowpeas, turnips	Gain, 22 lbs.

While hay alone was fed at a loss of four and a half pounds in 21 days, turnips and alfalfa made a slight gain, but when the ration was made richer and of great variety the gain was over one pound per day for each pig.

Every experiment and all the experiences of farmers attest the value of a variety of feeds, still a large per cent of farmers make no sort of effort to provide such variety. When it is remembered that in many cases the variety may be supplied by utilizing feed stuffs that hogs do not ordinarily eat and which are of comparatively little value, the importance of the proposition becomes doubly valuable. For instance, corn stalks cut at proper stage made into ensilage may be used by pigs with wonderful benefit.

VALUE OF PASTURE FOR PIGS.

We will now state two propositions bearing on economy of production, first, while the pig is not considered primarily a grazier animal, from the fact that he cannot be expected to make gains and grow fat if turned onto common pasture grass like cattle, sheep or mules, yet as a matter of fact the pig will make better returns for the amount of grass eaten than any other farm animal. Moreover, the pasture will increase the efficiency and value of the grain fed in connection with it. The second proposition is this: the pig is a gross feeder and will eat too much of rich feeds, as grain, more than he can use economically, more than he can digest well, consequently greater gains from a given amount of corn are obtained if the pig is fed less than he can or will eat. This statement applies with special force in cases of a long feeding period. The two propositions just announced are brought out in the following table:

Table IV. Value of Pasture—Full Feed vs. Partial Feed—Wisconsin Experiment.

Lot.	How fed.	Gain per day lbs.	Corn for 100 lbs. gain.
I	Full fed, dry lot	1.15	537 lbs.
II	Full fed, clover pasture	1.30	417 lbs.
III	Three-fourths full, clover pasture	1.20	377 lbs.
IV	One-half full, clover pasture	.87	352 lbs.
V	One-fourth full, clover pasture	.64	243 lbs.
VI	No grain, clover pasture	.36	....

In the case of lot I fed full in dry lot, 537 pounds of corn were required for 100 pounds of gain. In lot II full fed and having run of clover field there is a sudden drop in the amount required. But when we take advantage of the second proposition also and reduce the corn to three-fourths full feed, as in lot III, we have a still larger drop, or stated more directly, the increased efficiency of the corn given is marked. Nearly three bushels less of corn to produce 100 pounds of gain as compared with dry lot feeding. For growing hogs a still greater reduction of corn is advisable. The rate of gain is slower, but it is vastly cheaper. I have gathered a score or more of instances of farmers testing this. I myself have had quite a number of experiences proving the double value of pasture and limited feeding in the economic production of pork. I may say, however, that it is probably wise farm practice to feed full for the last thirty days before marketing. Pigs may be brought on to weigh 125 to 150 pounds at the rate of 18 to 20 pounds of gain from a bushel of corn.

But we do not always have clover or alfalfa pasture for hogs. It is of interest to inquire in how far other pastures will take the place. I call your attention to the Illinois experiment as follows:

Table V. Blue Grass Pasture—Twelve Weeks in Two Periods—Four Trials—Four Hogs in Each Lot—Illinois Experiment.

Lot.	First eight weeks.	Corn required. Lbs.	Next four weeks.	Corn required. Lbs.	Average.
I	One-half full fed............	433	Full fed	448	440
II	Full fed	465	Full fed	549	507
III	Dry lot full fed..............	532	Dry lot full fed	725	629

Table VI. Rape as pasture, two separate trials. Lots 1 and 3, fed on a ration of 2 parts corn and 1 part shorts and had run of rape patches. Lots 2 and 4 fed on same ration without rape.

Lots.	Pigs.	Rape.	Days fed.	On full feed.	Required for 100 lbs. gain—Lbs.
I	10	.36 acre..	76	One part shorts, 2 parts corn.......	243
II	10	Dry lot...	76	One part shorts, 2 parts corn.......	376
III	19	.6 acre...	42	One part shorts, 2 parts corn......	312
IV	19	Dry lot...	42	One part shorts 2 parts corn.......	433

The value of rape as a summer feed is unquestioned. Old feed lots, instead of being allowed to produce luxuriant crops of jimson and burdock can be planted to rape. I have seen many such instances verifying the foregoing table. Make the calculation and you will discover that the actual productive value of the rape in this case was equivalent to 46.4 bushels of corn to the acre. Just as good results are had from rye pasture for fall and early spring. Then might come early sown oats, then sorghum, then rape, then cow peas, making a continuous succulent pasture practically the year round. While farm animals do better when they have the run of a pasture than if the same growth of the pasture is cut off and fed to them as in soiling, yet the same yield will go four times as far when soiled. The time comes on when land will be so high that it will not be economy to turn stock onto the crops to trample them down and get only one-fourth of their actual value. The pig will do quite well on soiled crops. But the best plan, probably, would be to put the crops into the silo. Mr. E. N. Cobb of Monmouth, Illinois, feeds his hogs for fattening, a combined ration of silage and ear corn to great advantage. He feeds his brood sows on a ration of ten pounds corn silage and two pounds of oats daily. They do splendidly on it, and it makes a cheap ration. Clover in season, sweet corn, rape, etc., may be cut and fed to the pigs with profit.

There are a number of other problems that come up for solution. One would be the benefit of grinding. I discuss grinding feed more fully later on. Soaking and wetting feed has a value sometimes. But cooking feed has not shown good results. In fact, with some twenty experiment station tests it has turned out that cooked feed does not produce as great gains as raw. It seems natural for a pig to eat his food raw. It will take a long time to educate him up to such a degree of refinement as for him to require cooked feed. A daily ration of slops, however, is of great value, but it should not be given as an exclusive diet.

BALANCE THE CORN.

As we in Missouri are almost in the center of the great American corn belt and as corn is much the cheapest feed we can raise, much the most convenient feed, the endeavor should be to so use the corn as to get the greatest possible value out of it. But corn will not do its best if fed alone, and as a single feed. It is exceedingly rich in oil and carbohydrates, the great fat producing properties. If it has a weak place it is in the muscle producing property—the protein. The thing to do is to strengthen the weak element in the corn by combining some feed strong at the point where corn is weak. This may be done by combining with it clover, cow peas, alfalfa, bran, oats or ship stuff. Bran, however, is an expensive feed for hogs and is better suited for ruminants—cattle—sheep. There is so much crude fibre in bran that pigs do not get all the nutrient out of it like cows do.

It is scarcely necessary to call your attention to the necessity for an abundance of ash or mineral matter in our feeds for pigs. Corn is weak in mineral matter that goes to make up the bone. It is so easily supplied, however, in the form of wood ashes that it is no disparagement to the corn. The prudent farmer will supply his hogs with plenty of wood ashes and salt.

As to condimental food, so-called "stock food," it is far better to feed your pigs on diversified feeds, give them healthful environment so that through healthy nutrition nature may produce thrift which is better than to feed improperly and depend on condiments. Balancing the ratio will be of infinitely more value than dosing with medicine.

LONG FEEDS MAKE SLOW GAINS.

It is a common observation that pigs full fed for a considerable length of time make smaller gains. This is true with nearly all classes of stock. The following table bears on that point:

Table VII. Length of Feeding Period on Full Feed—Twelve Weeks.

Months.	Weight at beginning.	Weight at end.	Corn required for 100 lbs. gain.
1st month.......	222 lbs.	270 lbs.	418 lbs.
2nd month......	270 lbs.	313 lbs.	461 lbs.
3rd month......	313 lbs.	340 lbs.	559 lbs.

GRINDING GRAIN.

Considerable work has been done on this subject by the Missouri, Kentucky, Ohio and Wisconsin Stations. While the results show that on the average, grain when ground will produce a somewhat larger gain than when fed whole, yet the difference is so small that unless the grain is high priced it will not under ordinary circumstances defray the expense of grinding. For example, averaging all of these results on corn, it has been found that a hundred pounds of gain required:

Whole corn	521 pounds.
Ground corn	495 pounds.

Difference in favor of grinding, 26 pounds or 5 per cent.

This means that with corn at 40 cents a bushel, a saving of 5 per cent. would amount to about 2 cents a bushel which would scarcely bear the expense of grinding under ordinary circumstances.

These experiments were conducted chiefly with hogs that were old enough to do their own grinding. The results, therefore, do not apply with the same force to pigs that are just being weaned. This is a critical time in the life of a pig, and it will pay to grind the feed if even for a short time, or until they get well started. At this time it is especially important also to supply them with something besides corn. If oats are cheap, or wheat that will not grade on account of having been wet or for some similar reason can be procured at about the price of corn, it will pay to mix equal parts wheat and corn, or 2-3 corn and 1-3 oats, and grind the whole together and feed in a stiff dough but perfectly sweet. Under no circumstances should the grain be allowed to sour, nor should it be fed in a thin slop so as to tempt the pig to gulp it down without masticating it and mixing with it the proper amount of saliva. Scours, indigestion and improper assimilation follow in the wake of feeding the foods in a sloppy condition.

Again, it sometimes happens in the case of older hogs that have been fed for a long time on an exclusive corn ration, that they cease to thrive, and this difficulty may sometimes be partly remedied by grinding or soaking the feed, and oftentimes by cooking, but a much more effective remedy will be to give them a limited amount of ship stuff with the corn in winter; and in summer, by allowing them the run of a good clover, cowpea or Soy bean pasture. When hogs with plenty of corn are free from any specific disease, and yet cease to thrive, it is certain that they need a greater variety of feed. A limited quantity of artichokes or cull potatoes boiled will be very helpful at this point. Nothing is as good at this time as skim milk fed sweet.

THE VALUE OF DIFFERENT KINDS OF PASTURE.

The Missouri Experiment Station has just completed a very interesting experiment, in which bluegrass, red clover, alfalfa and rape pastures were compared. It is to be borne in mind that clover and alfalfa supplied more protein than either bluegrass or rape, and that they therefore balanced the corn which the hogs had in addition to the green feed, more effectively than either rape or bluegrass. These results are better shown by the half-tones made from photographs of each lot of hogs with the feed consumed and cost of gains shown under each lot.

Lot 5. Corn and Bluegrass—6 pigs.

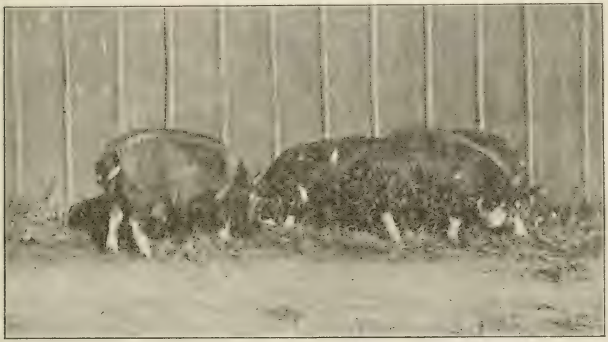
Weight at beginning of experiment 271 pounds.
Weight at close of experiment 656 pounds.
Total gain in ninety days 385 pounds.
Average daily gain per pig .71 pounds.
Grain required per pound of gain, 5.2 pounds.
Cost Per Hundred Pounds of Gain—Corn 40c per bushel, green blue grass $3 per ton—$3.92.

Lot 4. Corn and Green Clover—6 Pigs.

Weight at beginning of experiment 295 pounds.
Weight at close of experiment 767 pounds.
Total gain in 90 days 472 pounds.
Average daily gain per pig .87 pounds.
Grain required per hundred pounds of gain 4.29 pounds.
Cost Per Hundred Pounds of Gain—Corn at 40c per bu., green clover at $3 per ton—$3.20.

Lot 3. Corn and Green Alfalfa—6 Pigs.

Weight at beginning of experiment 283 pounds.
Weight at close of experiment 793 pounds.
Total gain in 90 days 510 pounds.
Average daily gain per pig .95 pounds.
Grain required per pound of gain 3.97 pounds.
Cost Per Hundred Pounds of Gain—Corn at 40c per bu., green alfalfa at $3 per ton—$2.96.



Lot 2. Corn Meal and Rape—6 Pigs.

Weight at beginning of experiment 284 pounds.
Weight at close of experiment 705 pounds.
Total gain 421 pounds.
Average daily gain per pig .78 pounds.
Grain required per hundred pounds of gain 4.82 pounds.
Cost Per Hundred Pounds of Gain—Corn at 40c.per bu., green rape at $3 per ton—$3.49.

Lot 6. Corn and Skim Milk—6 Pigs.

Weight at beginning of experiment 287 pounds.
Weight at close of experiment 1,269 pounds.
Total gain 981 pounds.
Average daily gain per pig 1.81 pounds.
Grain required per pound of gain 2.44 pounds.
Cost Per Hundred Pounds of Gain—Corn at 40c a bushel, skim milk at 15c per hundred—$2.84.

It will be noted that the cost per hundred pounds of gain of the lots fed in different ways was as follows:

Corn and bluegrass	$3 92
Corn and rape	3 49
Corn and clover	3 20
Corn and alfalfa	2 96
Corn and skim milk	2 84

These results therefore emphasize strongly what has already been said with reference to the value of balancing the corn ration. The three balancing foods used in this experiment were clover, alfalfa and skim milk, and it will be noted that in every case not only cheaper gains were made with these materials combined with corn, but that the hogs made more rapid gains.

In this experiment by using clover instead of bluegrass, a difference of almost 75c a hundred in the cost of gain was effected. When alfalfa was used instead of bluegrass, a saving in the cost of pork was almost a dollar a hundred or was made almost one-third cheaper. When skim milk was used, more than a dollar a hundred in the cost of production was saved. When we consider that clover will yield more than bluegrass, it is perfectly obvious that we can make much more pork per acre by providing them with clover pasture instead of requiring them to run on bluegrass. Unfortunately some of our farmers require their pigs to graze on timothy which is not as good as bluegrass even. I do not take the position that blue grass is not a good pasture, even for hogs—on the contrary it is the best grass for this purpose we have—but the clovers are far superior to any grass for this purpose, both in point of yield and in feeding value.

The high feeding value of rape as compared with bluegrass is of interest to every hog grower. It will be noted that the cost of gain where rape was used was about 45c a hundred less than where bluegrass was used. As has been pointed out, rape is one of the most productive green forage crops we have and may be grown at comparatively little expense and is practically a certain crop and must in the light of these experiments prove highly profitable to the hog raiser. Abundant experience shows that rape has even a higher value for sheep than for hogs.

A SUCCESSION OF PASTURE FOR HOGS.

It is not safe or even desirable to rely upon a single crop to furnish pasture for our hogs throughout the entire season. It is better to arrange for a succession of pastures fom the beginning of the season until the hogs are ready for market, making the feed richer and more concentrated toward the close of the season and as we approach the finishing of fattening period. For this purpose the following crops are recommended.

Red clover or alfalfa.
Rape.
Cowpeas.
Soy beans.

RED CLOVER OR ALFALFA.

On lands adapted to alfalfa it will undoubtedly prove to be better for hogs than red clover, inasmuch as it will produce a larger quantity of feed of a somewhat higher value. Inasmuch as we have not yet learned to grow alfalfa successfully on the majority of our upland clay soils, we shall be forced to rely chiefly upon clover. It starts earlier in the spring than any hog pasture we have excepting alfalfa, and would, therefore, be used first, and should be used as long as it is succulent and palatable. Usually not later than the middle of June the crop will have become so mature that the hogs, will relish a change for the time being, and the surplus clover should be cut and removed so as to allow the second or fall crop to start promptly.

RAPE.

This crop should be sown as early in the spring as the ground will work. The richer the land the better. An old feed lot, or land that has been heavily manured should be selected and broken in the fall if possible, so that only the surface will need to be worked in the spring. Sow in rows about thirty to thirty-six inches apart, using about three pounds of seed per acre, and cultivate level and shallow once or twice, or as often as is necessary to keep the weeds down. Each time the rape is eaten down it should be given a cultivation to facilitate its starting into growth again. By sowing broadcast the rape will not produce anything like as much as when grown in rows, but will be somewhat more palatable. At the Experiment Station almost twice as large a yield has been uniformly obtained from growing it in rows than from broadcasting. If sown broadcast, about five pounds of seed are required per acre, covered with a smoothing harrow. One of the secrets of success in growing rape in this climate is to get the seed in early. A frost or even a light freeze when the young plants are coming up will not hurt them. By the middle of May the rape is large enough to turn on, and it may be pastured at any time after that. If the green lice or cabbage worms attack the rape in any considerable quantities, it is essential to pasture it hard at once to prevent their de-

Rape field at Experiment Station; sown March 20th; photograph taken May 20th, 1902. Rape 30 inches high and ready to pasture.

stroying the crop. Severe pasturing is a complete remedy for these insects. By the time the clover has been pastured down the rape will be ready for the hogs.

It should be borne in mind that in changing from clover to rape we are changing to a less nutritious food as shown by the experiments already referred to, and it will be necessary to increase somewhat at this point the amount of corn the hogs are getting.

It is well to emphasize the fact in passing that it will pay to give the hogs some corn throughout the season, no matter what sort of pasture is provided, as nothing has been more clearly demonstrated than that the great profit in hog production lies in keeping them growing rapidly and in finishing them off young.

In the ordinary season a large area of rape will not be required. Two acres will carry thirty 100 pound hogs for a month or six weeks in the first crop, and will in seasonable weather recuperate in less than a month so that they may be turned on again. Usually in this climate we eat rape down three or four times during the season.

COWPEAS.

To provide a crop of cowpeas in the best condition for hogs by the time the rape ought to be eaten down, it will be necessary to select some very early maturing sort and sow rather earlier than is advised for a gen-

Variety test of Cowpeas at Experiment Station showing varieties best adapted to hog pasture, such as Sherman's Northern Prolific, New Era, Warren's Extra Early and Whippoorwill.

eral crop. For this purpose I would recommend the New Era, Sherman's Northern Prolific or Warren's Extra Early, to be sown about the middle of corn planting time in rows about thirty inches apart and cultivated shallow and level as often as is necessary to hold the weeds in check. For the best results the hogs should not be turned on the peas until the first pods are turning yellow. They will, however, make good pasture before this time, and if the hogs are needing pasture I would not advise waiting until they reach that stage of maturity. A larger area of cowpeas for hog pasture should be sown about the end of corn planting time and for this purpose I would recommend the whippoorwill or black variety. These may be sown broadcast and covered with a spring toothed harrow or what is better, sown with a grain drill letting all hoes run, using from a bushel to a bushel and a half of seed per acre. They will require no subsequent cultivation and will come on about the time the earlier varieties mentioned have been eaten down.

SOY BEANS.

As a grain crop to use in connection with corn for fitting the spring crop of pigs for the market, the Soy bean is a very valuable crop. It is essentially a grain plant, very rich in protein, and while the hogs are running on Soy beans they should have access to corn to balance the ration. While the corn does not contain enough protein for the best results, Soy beans contain more protein than is profitable to feed, and the combination of the two grains is therefore much better. The Soy bean matures about the same time as a medium early corn, like the Leaming, and the two crops could be grown in the same field so that the hogs could have access to both without further labor. If this is not feasible, the corn should be thrown to the hogs every day. I would advise the use of the early yellow variety sown in drills about thirty to forty inches apart, using about three pecks to the acre and cultivate shallow until the plants completely shadow the ground. The hogs should be turned in when the first pods begin to ripen.

While I consider the Soy bean somewhat better for finishing a bunch of hogs than the cowpea, at the same time if one does not care to bother with so many different crops, the cowpea may be used instead with satisfactory results.

For brood sows in winter and very early spring, it is always advisable to give them access to a piece of early sown wheat or rye, and to let them have a limited amount of nicely cured clover, alfalfa or cowpea hay by way of variety of feed. Sorghum stalks grown as is customary for the production of syrup, in limited quantity, make an excellent addition to the ration. The main thing to be avoided in carrying hogs of this sort through the winter, is a straight corn diet. The greater the variety of cheap materials like these, the better the sows will do.

THE FARM WORKSHOP.

(C. D. Lyon, Higginsport, Ohio.)

As well for the purpose of making the boys satisfied with farm life as for the economy of doing odd jobs on the farm, we think that the workshop and the tools should be found on every farm. For years our own has been a 12x16 foot room in the corner of a barn, and we have passed many a wet day with pleasure and profit to ourselves in repairing the old and making new implements, gates, ladders and other things useful upon the farm.

A twelve-foot work bench with a carriage maker's vise stands by the window. This bench is of two-inch elm lumber sawed from a log cut on the farm. The tool chest is kept under the bench and a tool rack hangs on the wall above it. A chopping block stands near the middle of the shop, and back of this a shaving horse. Overhead is stored lumber of various width, thickness and length. Now for the tools. These are not in as great variety as we could wish, but are sufficient for the needs of most farmers: Steel square, cut-off saw, rip saw, claw hammer, heavy hatchet, shingling hatchet, draw-knife, brace and six bits, groove ¼ to ¾ inch, also four twist drills, ¼ to ½ inch for drilling metal, three augers 1¼ and 1½ inch, four chisels ¼, ½, 1 and 1½ inch, mallets, awls, cold chisels, punchers, and other small tools that have been bought from time to time. We have three planes, but a good jack plane will do for most work.

There is a regular horseshoeing kit in a shoeing box and either of my three older boys or myself can drive a shoe as well as anyone. There should be a heavy piece of iron for an anvil. This can often be obtained from some dealer in old iron at a small cost. Always have a regular smith's or machinist's hammer to use on iron. This lot of tools, all of good grade, can be bought for less than $25, and they will pay more than twenty-five per cent rent on the investment every year. A good grindstone and oilstone are part of the outfit, and both must be used often enough to keep all tools sharp. For several years all of our tools were kept bright as new, and this is a very desirable matter, but years of use has dimmed the polish and we are as proud of them as we ever were.

In the past fifteen years we have never been obliged to go to town for double tree, single tree, neck yoke, hoe, mattock or axe handle, or even for wagon or implement tongue. Six sleds, one sold for eighteen dollars and one for $10, three hay ladders, one sold for $9, wagon beds, gates, farm ladders, a sleigh, a cupboard, a wardrobe and many other things for home use have passed over that work bench in that shop.

The neighbors should be made welcome to use the shop and tools, and if they are like my neighbors they will not abuse the privilege accorded them. Your speaker was not brought up to the use of tools as our old "kit" consisted of saw, hatchet, square, plane and drawknife, but since coming to manhood has made a fine workman. Two or three years ago one of my boys saw a lawn swing for sale $7.50 and asked me to buy it. I proposed to buy him the lumber and let him make one and he consented although it was his first complex job. The lumber cost ninety cents and in four afternoons he had made a better swing than his model.

The lumber for an ordinary farm gate costs $1.25, the bolts 20 and the paint 15 cents. I can make and paint four of these gates in a day, and they cost four dollars each at the wagonmakers in town. The lumber for a farm hay rack costs about $1.50, the bolts fifty cents and the paint 20 cents. I have made one in a day and sold it for $9. It is not the saving in money and time as much as the real satisfaction in being able to do these things yourself that makes the workshop so desirable.

I have been very glad to note that many Missouri farmers have such a shop and make good use of it, and I urge those who have not to install one upon their farms.

FARMERS AS BEEKEEPERS.

(By Geo. W. Williams, Humansville, Mo.)

In talking on bee culture from a farmer's standpoint, let us say that it is not expected that every farmer should or would become an expert in the handling of bees, nor is it necessary that he should be an expert to produce all the honey he needs for home consumption.

But in this day of improvement in all lines of farming, so much has been said about new methods of doing everything, that the farmer who is not an expert in a certain line leaves it alone or turns it over to the fellow who is making a specialty of that line, and the fellow who is making a specialty of the industry does all he can to discourage and dishearten the man who is following old methods and old ways by calling him "an old fogy." In fact there is too much of this done: for we sometimes find that the new and so-called improved methods are not as profitable as the "old fogy" way. Especially is this true of the man who is not adapted to that certain business. I believe that fitness or adaptability has a great deal to do with the success that we make out of our business. Yet many a man makes a fair success out of a business that is not his calling, and because we cannot all become experts in breeding fine cattle, fine hogs or fine poultry, it does not necessarily follow that we must not try to raise cattle, hogs or poultry on our farms. but on the other hand attend to the raising of these things, using the best facilities at hand.

Taking the country over, mixed farming is the usual thing, though it is all right and proper that we should have specialists in different lines, for it is to them that we owe the most of our improved stock, etc.

Because each farmer cannot be a bee expert is no excuse for his not keeping a few colonies of bees and having honey on his table the year round.

While I would advise the use of a movable frame hive and pound sections. I would not discourage those who do not want to go to that expense and trouble and prefer to have bees in the old fashioned box hive with cross sticks to support the comb. If you are going to keep your bees in that kind of a hive, you should know what size to make your box for best results. If using ten-inch lumber, cut three of the pieces fifteen inches long and one piece three-eights of an inch short of fifteen inches. Make this short piece the entrance at the bottom. Nail together good and strong. This makes a hive eight and one-half by ten inches inside measure by fifteen inches high. Put in cross sticks seven inches down from the top; this makes a very good brood chamber. For a top, cut a piece fourteen inches long and twelve inches wide; bore four or five one inch holes in this and fasten it on the top and your hive is made. It need not take over fifteen minutes to make it.

When the bees swarm, lay a board over the holes in the top, lightly tacking it on; hive them in the box hive and when all are in, take them *at once* to their permanent place. Do not wait until night to move them, for they go to work at once and get their new location, and if moved after locating, many will be lost, as they will come out and go directly to the field and when loaded will return to the place they had located and finding no home there, will get lost. This is a big loss, for just at this particular time, every bee counts, for it will be fully twenty-one days before there can be any young bees in that hive, and about thirty-five days before any bees except those that went in with the swarm will go to the field as workers; so it is very important that all the bees should be saved.

The second day after hiving, take the board from over the holes in the top and turn bottom side up over the holes a box eight inches square and six or seven inches deep. Put a weight on it to hold it in place. I should have mentioned that the hive should be set in the shade or shaded with boards, and if an inch block is placed under each corner of the hive and left there until the hot weather is over, it will give ventilation. When the swarm comes out, they are warm with excitement and after they have been hived, should be set in a cool place, lest they get too hot and come out.

The object in waiting two days before putting the box on, is if the box is on when they are hived, the bees will sometimes go on up in the box and begin comb building, and the queen will lay her eggs in the comb and it will be used as a brood chamber. But by waiting until they have started their comb in the brood chamber, the chances are that the queen will never go up in the honey box.

When this box is filled, take a fine wire, raise the box just a little, draw the wire between the box and top, empty the box and place it back, or put on another, setting the full one in a warm, dry place. Never put honey in a cool, damp cellar. Instead of using a box, place a small sized wooden water pail upside down and let the bees fill it. It makes a beautiful bucket of honey and is so easy to handle and if you wish to sell it, it can be carried to market just as the bees stored it, which is quite a curiosity to the merchant.

I know a farmer who has just such hives as I have described and uses a bucket on top and has honey on his table at all meals. He has only five or six "stands of bees." If he is about the house when they swarm, he hives them and if he is not there his wife hives them. That is all he ever does to them, winter or summer, except to change the buckets when full.

Never take any honey out of the "hive" when it is made the size given. Leave the bees alone in this hive and let them have it for a brood chamber. They will need all they store in it, and if they gather more than they need, they will store it above.

It is not necessary to be fussing with the bees all the time to get honey. Even the so-called expert, fusses and handles his bees more than is necessary; in fact, many times if he handled them less he would get more pounds of honey.

While it is true that the man who has made the bee a study and keeps his bees in the best latest improved movable frame hive and understands how to control swarming, when to crowd, when to give more room, when to put on and when to take off supers of sections or extracting frames, will get more pounds of honey from a colony than the man who keeps them in a box hive and gives them little or no attention, yet it is a question whether the former gets enough more to pay for his extra trouble and expense. It is right that the man who turns all his attention to bees, as in any other industry, should be better rewarded than the man who gives it but little attention.

Now, brother farmers, why not get you a "stand" or two of bees, and spend fifteen or twenty minutes in making a box hive ready for the swarm when it issues, and raise your own honey? You need be at very little expense, even though you have a dozen or more colonies. You can make all your own box hives, as you have all the tools necessary. You will need a bee-smoker to control them and assist you in hurrying them in the hive while they are swarming, as there are always a few that linger around, careless about going in. This smoker will cost about one dollar. If you are afraid of getting stung, use a veil. Try it, and see how easily you can keep your table supplied with one of the most wholesome sweets, and if you turn it over to your wife, she will make it a source of a nice little income, with very little expense or trouble to you. If you have to buy your start, get them with as much Italian blood as possible, as the Italians are a little better honey makers and will keep their hive clean of moths if they have a good queen.

In keeping bees in a box hive, the greatest trouble is the moth worm, as there is no way to look after this pest. While I would advise every one to keep his bees in a movable frame, I would rather you kept them in a box hive than not to keep them at all, and if the simple instruction I have given above is followed, they will prove a very valuable adjunct to the farm.

MISSOURI DAIRY ASSOCIATION.

Abstract of Addresses at Annual Meeting held November 11, 12, 13, 1902.

PRESIDENT'S ANNUAL ADDRESS.

(By J. J. Smith, Sweet Springs, Mo.)

When the Missouri State Dairy Association met at Palmyra last year we were asked by many where our next meeting should be held. Our reply to all was, "Columbia, if the proposed dairy building should be completed by that time." We felt that the members of this association and the creamery men, dairymen and those interested in the various branches of dairy work could not better show their appreciation of the exceedingly liberal appropriation made by the last legislature for the advancement of the dairy interests of the state, than by holding our 13th annual meeting in the building erected for the purpose of educating our farmers in what should be one of the leading industries of the state, and one to which because of our mild climate and diversity of grasses, it is peculiarly adapted.

New Dairy Building, Missouri Agricultural College.

We are here. We have looked over the buildings. They are models of their kind, erected of good and enduring material, well built and finished nicely and conveniently arranged, showing that the appropriation has been wisely expended, and when they are completed and equipped, as we are informed they will be, with the latest improved machinery and apparatus, Missouri will have a dairy school and buildings second to none in the country, and superior to most of them.

Among the neighboring states Missouri has the name of being slow to take up dairying, and annually we have been drawing on them for practical men and speakers to come and "show us!" We hope before long to reverse the order of things and help "show them." It is now "up to" the farmers, dairymen and creamery men of Missouri to decide whether they will avail themselves of the practical instruction in dairying and creamery work here to be obtained at a light cost, and thus encourage the work for which the appropriation was made. Every member of this association should at once take up the work in their respective localities and encourage our young men to come and take the short winter course in dairying, feeding, breeding and selecting dairy cattle, information which I find by experience with creamery work in Missouri, many of them need.

I desire to call the attention of the association to the poor facilities provided for the exhibit of dairy products, machinery and dairy cattle at the State Fair at Sedalia. All who attended the fair this year will doubtless remember that a very small space (about 8x10 feet) in one corner of Agricultural Hall was provided for the dairy exhibit, with a very small refrigerator for butter exhibit—and it always out of sight.

A search warrant would finally locate the dairy machinery exhibit in a little shed alongside one of the main buildings, and the dairy cattle under a tent or tied to a barbed wire fence surrounding the enclosure. The horses, mules, fat cattle, sheep and chickens were nicely housed and provided for. An effort should be made by this association to secure a good dairy building on the State Fair ground, in which all dairy products, apparatus and machinery should be exhibited. Space should be provided for operating hand machinery and a glass front refrigerator provided for the butter exhibit.

The coming session of the legislature will no doubt make—as it should—a very liberal appropriation for improvements on the State Fair grounds, and we should request and urge the board to set aside a reasonable amount for a building, to be used as above suggested. Much good can be done for the dairy interests of the State if the superintendent is a live, up-to-date dairyman, and the dairy interests should be consulted in deciding upon and arranging this part of the premium list.

A more liberal use of the columns of the agricultural press of the State by creamery men, dairymen and butter and cheese makers generally in the exchange of ideas, every day experiences, etc., would aid in working up a greater interest in dairy work among our farmers.

My experience in operating creameries in Missouri has been that in many sections of the state conditions for their successful operation differ in some particulars, from those of the recognized dairy states, and it has been a question with me whether it would not be best for a creamery man to accept the conditions as they exist and shape their business accordingly.

One of the most serious questions that we have to contend with is a supply of good living well water for the cows, and the proper cooling of the milk. In most sections of the State a good supply of living well water can be obtained by drilling into the rock. This being a little expensive many farmers content themselves with the cheaper and easier method of obtaining a water supply by means of cisterns at the house and ponds for stock water. This gives a limited amount and often no water for cooling the milk—and a very poor kind of water for any stock. It is one of the easy-going practices of the Missouri farmer, that education will finally change. This brings the milk to the creamery usually in such shape that by the time it is all mixed and run through the separator, and the farmer gets home with his skim-milk it has developed so much acid that it is unfit for feeding the young calves, hence they must have fresh milk, and usually get about as much butter fat as the creamery does. They care for the calf first and the creamery man gets what is left. The average Missouri farmer thinks more of the calf than in the older dairy sections, and prefers to combine the two and breed for beef as well as milk.

The only relief I have had from the above conditions has been through the use of the hand separator. It requires no water for milk cooling, and but little to care for the cream. It gives fresh, sweet, skim milk for the calves, and I find that the creamery operator gets a material increase in butter fat that formerly went to the calf. Taking the patrons who formerly hauled milk, and are now using hand separators I find that from the same number of cows they have nearly doubled the number of pounds of butter fat. Comparing the amounts paid, last month, to the patrons who are using hand separators and those who are hauling milk, I find that the average amount paid to those who are using hand separators and delivering cream only, is in round numbers $33.00 and those hauling milk $18.00 each.

My experience thus far convinces me that creamery operators should encourage rather than discourage the use of the hand separator. It seems from results to mean an increased business for the creamery, and greater returns for the farmer, two very convincing arguments to me in their favor.

HOW CAN THE MISSOURI FARMER NOT IN REACH OF A CREAMERY BE A SUCCESSFUL DAIRYMAN?

(By John Patterson, Kirksville, Mo.)

If the farmer is not in a locality where the milk will sell, he must learn to make a good edible and salable article out of the milk. It can be made into butter or cheese. Before he undertakes it, he should calculate how he can make dairying pay better than the growing of corn or hay, or the raising of cattle or hogs for sale. That will depend upon how much you make, how well you make it and how successful you are in selling it. If you make a good article of butter it must not go to market as common country butter, but must be made and put up in a marketable shape, so that in the opinion of the merchant and consumer it can compete with creamery butter. You can best learn dairying by taking a course in dairy instruction at our Experiment Station. If you cannot go there yourself, and have sons and daughters, send them there, or hire some one who has taken a course in dairying at that institution, or pick out a good girl or boy and send to the dairy school with the understanding, when he has finished the course he will work for you. If you cannot do this, do not give up, you can learn by talking with some one who knows the business and by reading good dairy papers. The old saying is true "Where there is a will, there is a way."

If you tell your neighbors of your intention to try that kind of work, you are sure to get discouraging advice. They will tell you how much work there is in it, how many have gone at it and failed. They never know or tell how many have worked at dairying and paid for their farms and built good, comfortable homes and made comfortable livings thereby. You can go into parts of the country where dairying is the principal occupation and find that dairymen have succeeded in their business and their land is not worn out.

How can one make a success at dairying? Start with good cows, but do not be too quick to condemn the cows you have till they have had a fair chance to show what they can do. A cow on poor pasture, on corn and timothy hay, exposed to all sorts of weather does not have a chance to do her best for you. Give her good pasture and feed her plenty of good feed. If when fresh she does not give twenty or thirty pounds of milk, testing three per cent or more, you may consider that you have a clear case against her and you may sell her to the butcher and find some way of getting a better one. Your success depends on good cows and good, plentiful feeding of the kinds of feed that produce the most milk, giving your cows comfortable quarters and kind treatment. You need not take the old woman's notion to kiss the cow, but I believe a cow will do better if combed, brushed and stroked. Some people believe they can break a cow from kicking by beating her with milk stools, sticks or clubs. I think it always makes her worse and would advise any one not to do it.

Now about the feed: I spoke of corn and timothy hay being not the best feed to produce a good flow of milk. Clover is much better than timothy hay, but corn, when just out of the roasting ear and commencing to glaize and dent, while the blade and stalks are green, if run through an ensilage cutter and put in an air-tight silo will keep its natural succulence and is the best winter feed; the nearest approach to green grass in the summer. I use common field corn, big or little as I have it. I have four silos, one holds three hundred tons, the other three one hundred tons each. I raise cow peas to mix with corn in the silo, alternating a load of corn with a load of cow peas and in that way I think I get better feed than corn alone would make, and am well pleased with this way of preserving feed for stock, not only cows but young stock and horses. I have found no better way of getting valuable feed; it makes a very busy time when we are putting it up, but when that is done, we have good feed whenever needed.

It took fifteen men and a twelve horse power engine nearly six days to fill my three hundred ton silo with cow peas and corn. Six of these men were detained until nine o'clock in the morning and quit work at four o'clock in the afternoon to do the milking, but the other nine commenced work at seven in the morning, had an hour noon and quit work at six in the evening. They used six wagons and teams. I paid the extra hands $1.00 a day, without board; I paid for the engine and engineer $5.00 a day, so it cost me about $120 to fill a three hundred ton silo. I winter each cow on four tons. I found it took from seven to ten minutes to run a load through that we estimated weighed more than a ton.

I want to speak of the benefit it would be to the farmer to engage more extensively in dairying. If rightly conducted, he can make more money thereby and have a better farm. It makes more work but the profit pays for the excess of work. I do not like to speak of myself, but venture to do so for your benefit. The year 1901 was certainly our hardest year. I had only enough feed for four hundred tons of ensilage and very little hay in the fall. I doubted whether it was best to use what feed I had and attempt merely to keep my stock alive till spring, or buy feed to make the cows give enough milk to pay for the feed. I wondered if I could make any profit with hay at $13 to $15 per ton, alfalfa shipped from Nebraska, bran at $20 to $22 per ton, cotton seed meal at $26 to $28 a ton and pay six hands to do the work. I undertook to give my cows good feed so that they could pay for it, and they did. I bought $1,500 worth of feed and came out with very little pay for my work, but when spring and grass came and we quit feeding, my cows looked well and gave a good flow of milk, which they could not have done had they not been well fed during the winter, and we sold over $100 worth of butter a week for a considerable time. I do not know just what I could have done had I had beef cattle, but I suspect I would have had to sell them to pay for the feed and had nothing to make profit with; but my cows paid for their feed and were ready to make more for me. I advise farmers to go into private dairying. You can churn and make the butter as easily as you can take it to a creamery, if there is one near you, and you do not have to suspect the creamery man does not test your milk right; and will have all the skim milk and butter milk to feed your calves and pigs.

I want to advise you about apparatus for making butter. If necessary for a little while, use what you have, but as soon as possible get a good separator and a good churn and when you get tired of a hand separator, use some kind of power and build a suitable room for it. I have used a two-horse tread power for six or seven years, but last spring I got a four-horse gasoline engine and I like it best.

DISCUSSION.

Mr. Patterson: When I first went into the dairy business a man came along and tried to get me to buy a separator. I did not think I needed one, but he was persistent and showed me I was just losing a dollar every day by not getting all the butter fat that the milk contained. If dairying is not rightly conducted it will not pay expenses. So many of our farms are so badly managed, the land just sown and resown in corn until its fertility is all gone; but even with the proper rotation of crops I believe there is more money in dairying than on a common farm. In dairying you get your money every week, while in raising hogs and cattle you have to wait so long before you get your returns and this makes a big difference, so I think the dairy business is preferable. Then dairying does not deplete the land as does ordinary grain raising.

Prof. Eckles: Most farmers in this State are not situated like Mr. Patterson in regard to the number of their cows. Most farmers of this State have only six to ten or twelve cows. Would Mr. Patterson recommend a man having no more cows than that to fit himself for making butter or sell his milk to a creamery or separate his cream and ship it to the creamery?

Mr. Patterson: Circumstances alter cases. A man should be his own judge as to what is best. If he is near a creamery and has confidence in it that it can make as good an article of butter as he can, it might pay for him to sell them his cream. But I was speaking of the man who does not live near a creamery. There is no creamery near us. It will pay the man who has ten cows to get a separator and he will soon have enough money to have twenty cows. I always advise a good sized separator.

Mr. Erwin: I want to corroborate what Mr. Patterson has said in regard to the private dairy. After quitting the dairy business for a number of years I drifted back into it and am milking some twenty-four or twenty-five cows. I make my butter at home and I find that it brings in a very comfortable income and I think pigs and chickens are a natural adjunct of the dairy. I have found since I have been engaged in the business of dairying in a smaller way that the actual number of dollars and cents gained have been greater than when I ran it on a more extensive scale. You cannot take ten cows and get as good results in proportion as you can get from one cow and when you increase the number to fifty or seventy-five or one hundred cows, the amount of gain per cow is much more with the smaller number of cows.

SOME POINTERS FROM TWENTY YEARS' EXPERIENCE IN THE RETAIL MILK BUSINESS.

(By Mr. A. H. Shepard, Columbia, Mo.)

The point that I have always found most necessary in supplying the milk to the city market is that you should always have an adequate supply, not only of good, pure new milk, but of good cream, good sweet skim milk and sour milk. There is a demand for all these and if the customer fails to get them then they revert back to the town cow and you have lost a customer, but if you are always ready to supply the demand there is no trouble in maintaining a good trade in a town like this. It is important, of course, absolutely necessary, that the goods you offer are of such a quality that your customers can have perfect confidence in you. They must be sure they are getting a good article. Nothing makes a man so mad as to get something to eat and find that it is not good, it makes him mad all the way through.

It is important to have a good herd of cows. I was impressed with a little point made by Mr. Patterson—I do not know that I can express it as he did—while a good herd is important, a good herdsman is of greater importance. I would rather take a scrub herd in the hands of a thoroughbred herdsman than a thoroughbred herd in the hands of a scrub herdsman. I have found that out by experience. I have seen very fine herds in the hands of bad herdsmen and the result was simply a loss, while I have seen common herds, give good results when in the hands of a good herdsman.

The thing is to produce a good article and deliver it to the city customers regularly, carefully, promptly and in a nice condition and they will be satisfied, and my experience is that it is more profitable than the making of butter or cheese. In all I have had about thirty-three years' experience in dairying, seventeen of which have been in the retail milk business and the others in butter and cheese making and as far as profits are concerned, I find much better profits in selling milk and cream where you have a good market than there is in either of the others.

For the retail trade we put the milk in bottles. It is a little more expensive but gives better satisfaction.

DISCUSSION.

Mr. Erwin: Do you not find that the percentage of loss in measuring more than makes up the price of the bottles?

Mr. Shepard: No. You will save some in measuring, but it will not make up for the loss. There is too much breakage in the bottles and the same wagon cannot carry as much milk, the bottles occupy about three times the space. The milk is poured into the bottles and these put up in cases and the spaces between the bottles are filled with crushed ice.

Mr. Smith: Do you test your herd?

Mr. Shepard: Yes, and I find customers do not care so much about the extra rich quality of milk as they do for the milk to be pure and nice and well flavored. And it is important in securing a good flavor to the milk to be very particular as to the feed of the cows. The pastures should be as nearly free from weeds as possible; there should be good grass and the feed should always be first class. I never buy any corn unless it will grade No. 2. There is a great deal of corn shipped in that will not grade and it is not fit for the dairy cow. If feed is slightly musty it is not fit for dairy cows. At this time of the year I supplement the pastures by wheat. Sow wheat each year early and at this time of the year it makes a very fine pasture and it produces a good flow of milk.

Mr. ———: Does it not spoil the flavor of the milk?

Mr. Shephard: Not at this time of the year. If cattle are turned on it suddenly in the spring, it will make quite a change in the flavor of the milk, but after they have been on it two or three days the milk has no objectionable flavor. I think it is mostly in the change of flavor, there is nothing bad about it as soon as one gets accustomed to it.

Mr. Erwin: Is not this flavoring due to the indigestion of the animal rather than to the feed? If you do not permit them to take full feed, but only partial feed so that there is no scouring, you will not observe it at all.

Mr. Shepard: I think they will observe the flavor anyway. It is different from the flavor given by the winter feed and that is why they notice it; but as soon as the customers become used to it it is all right, but they are apt to be suspicious of a sudden change.

I never use the milk of cows far advanced in pregnancy. A cow should be allowed to go dry at least two months before calving time. The flavor of the milk is bad several weeks before calving. A cow will give more milk and better milk by milking her ten months and allowing her to go dry two months than by milking her the whole twelve months and you can get a stronger calf and one less liable to sickness.

Mr. ———: A farmer I knew pastured wheat right down to the ground. Could he do that every year with success?

Mr. Shepard: I do not think it hurts it much. Two years ago I pastured till the first of May and the result was good, I took the cows off the wheat and got twenty-six bushels to the acre. That is the largest yield I have ever had from wheat pastured. The way I do generally is to pasture it to the 10th of May, then plow it up and sow it to cow peas and get the cow peas off by the first of September. The ground is then in fine condition for wheat, and by simply sowing without working it you can get a good crop of cow peas and pasturage for several months.

Mr. ———: Don't you think there is a way to overcome the flavor of grass or rye in milk. Give them dry feed a couple of hours before milking. I do that way.

Mr. Shepard: My practice is to put the cows on it just after milking in the morning and let them stay one hour, the cows will fill and sometimes look like they were bloating so they could not get their breath from the wheat, and then I do not let them run on the wheat any more that day.

Mr. Smith: Do you pasteurize your milk?

Mr. Shepard: No, I sterilize the bottles but do not heat the milk.

Prof. Eckles: What is the best way to dispose of your surplus?

Mr. Shepard: If there is a surplus, make it into butter and feed the skim milk to hogs. Of course if there is a creamery near by, it would be better to send the surplus milk to the creamery.

Mr. Patterson: Do you ever have any trouble with the flavor of wild onions in milk?

Mr. Shepard: I have not had any trouble on that account for years. The way to prevent it is to feed the cows very liberally at the time, for the cows will eat onions only when they are hungry. Another thing that damages milk is bad water. A thing of the greatest importance is give your cows good, pure water and not a muddy branch to drink out of and give them good, clean troughs.

THE WINTER'S RATION FOR THE DAIRY COW.

(By H. C. Goodrich, Calhoun, Mo.)

Someone has said that there are many cowkeepers but few dairymen. When we consider that the average annual production of the cows of Missouri is scarcely more than 150 pounds of butter and that there are herds that average 300 to 350 pounds yearly we realize the difference.

Why this difference? Why is it that the average Missouri cow produces so little? There are three requisites to success with cows:

1st. The right kind of cows.

2nd. The right kind of feed.

3rd. The right kind of care.

Now we know that there are a number of cows of special beef breeding that are kept principally for breeding purposes and are seldom milked; but leaving these out of consideration there are a great many cows that because they have been bred along no particular line and have never been properly cared for are worthless so far as dairy purposes are concerned. To obtain the greatest success with dairy cows one should have animals that have been developed along dairy lines until that has become to be their principal function, in short the special purpose dairy cow.

But there are a great many really good dairy cows that because of improper feeding and care are not making a good showing, nor their owners any money. Let us then for a few minutes take up the subject of feeding dairy cows.

This is a large subject; quite too large for me, involving as it does a study of balanced rations, prices of different feeds, digestibility, palatability, and, from the farmer's and dairyman's standpoint, what crops to grow on the farm.

The original and natural ration is pasture grass and there is nothing that equals fresh pasturage for the production of milk and butter. But we cannot have fresh pasture the year round in this climate. True we can by sowing rye or wheat have late fall pasture and again very early in the spring, and it will pay to do so, but after hard freezing weather pasture is no longer satisfactory and we must looke elsewhere for feed. Indeed it will not do to depend wholly on pasture for a ration for cows but a very small portion of the year, but we must stand ready to supplement it with some other feed much of the time. In my herd I always feed a little grain feed no matter how good the grass may be.

The chemist will analyze our pasture grasses and tell you that they contain all the elements to make a perfectly balanced ration. He will also take the same grasses when carefully cured and tell you that they contain practically the same elements as before except that there is less water. Now anyone knows that you cannot take these same cured grasses and by the addition of the proper amount of water make fresh green grass any more than you can add water to dried fruit and make it fresh again, and as fresh fruit is much better to most people's taste so fresh green fodder of any kind is better than dried to the cow.

There is something in the green feeds that the chemist cannot analyze. We call it succulence, and because it adds greatly to its palatability it plays an important part in the digestive economy of the cow. How then shall we supply during the winter months that succulence that the cow so much delights in? There are two ways or rather there are two substitutes for green feed that are available. One is by growing root crops, but that calls for a great deal of labor in growing and harvesting and a large amount of storage room where the crop can be stored out of reach of frost. On that account they have never been largely grown in the west. A better way to supply a succulent feed is by putting up ensilage. This while it is quite different from the green fodder yet retains it succulence. It is true that at the Wisconsin Experiment Station practically the same results were obtained with cured corn fodder as with ensilage, but this fodder was cured under perfect conditions such as it is almost impossible to obtain in ordinary farm practice, and the fact remains that ensilage is more palatable than cured fodder no matter how carefully cured. All things considered siloing is the cheapest method of harvesting the whole corn crop.

Ensilage should form a large part of the winter's ration, but some dry fodder or hay should always be fed. If possible this cured fodder should be some kind of legume, clover, cow pea, Soy bean, alfalfa or vetch. I have always used corn fodder for ensilage. Plant with corn drill twice as thick in rows as for a regular corn crop. On good ground, if the season is favorable, I will get a good crop of ears and a large amount of fodder, but if we have too much dry weather we will get a good crop of fodder but not so many ears. The past season my ensilage corn would have made seventy-five bushels to the acre.

Sorghum for ensilage is highly spoken of by some. I tried a patch this season. Drilled it with corn planter pretty thick in rows. It made a large growth, but lodged down so that it was a great deal of work to harvest it. If it could be kept from lodging it would handle very well and give a large crop, and in a dry season like last year would still give a good crop. Sorghum is a very valuable forage plant. Sown thickly and cut and cured like hay it yields a large crop which is readily eaten, and it retains much of its succulence until late in the winter. Clover, cow peas and Soy beans can be grown almost everywhere in this State. Alfalfa is on trial, and has been successfully grown in several places. The hairy vetch is well reported of elsewhere, and while I do not know that it has been tried to any extent in this State, I believe it would do well.

Now it is not enough that we give the cow plenty of good feed, but we must give it in the right proportion. Scientific feeders and investigators have worked out a standard for feeding milch cows that may well be taken as a guide. Woll's American Standard Ration for Dairy Cows, compiled from the averages of rations fed by over one hundred successful dairymen in different parts of the United States, is:

Dry matter.	Protein.	Carbohydrates.	Fat.
24.50 lbs.	2.15 lbs.	13.30 lbs.	.75

Taking this as an average bases let us consider a few sample rations.

	Dry matter.	Protein.	Carbohydrates.	Fat.
40 lbs. corn ensilage	10.56	.52	5.60	.28
8 lbs. clover hay	6.77	.54	2.86	.13
6 lbs. corn meal	5.34	.47	4.00	.26
2 lbs. Soy bean meal	1.80	.68	.56	.32
Totals	24.47	2.21	13.2	.99

Average cost of above ration, 11.2c.

	Dry matter.	Protein.	Carbohydrates.	Fat.
40 lbs. silage	10.56	.52	5.60	.28
8 lbs. cow pea hay	7.14	.86	3.09	.09
4 lbs. corn meal	3.56	.31	2.67	.17
4 lbs. wheat bran	3.52	.50	1.54	.12
Totals	24.78	2.19	12.90	.66

Average cost of above ration, 11.1c.

	Dry matter.	Protein.	Carbohydrates.	Fat.
40 lbs. silage	10.56	.52	5.60	.28
8 lbs. cow pea hay	7.14	.86	3.09	.09
7 lbs. corn meal	6.24	.55	4.67	.30
1 lb. Soy bean meal	.89	.34	.28	.17
Totals	24.83	2.27	13.64	.84

Average cost of above ration, 10.7c.

No. 1 gives a very well balanced ration all of which can be grown on the farm, so do away with buying mill feed. However, it may often happen that it would be cheaper to buy some mill feed than to try to grow all our feeds on the farm. Wheat bran is a very fine feed for cows, and may well form part of every ration. It gives bulk to the concentrated portion of the feed, and I always like to mix a little at least with grain feeds. There are several other products of the mills that are excellent feeds and usually cheap when their feeding value is considered. Cotton seed meal is one of the cheapest feeds a dairyman can buy at the usual prices. I should feed much more of it, but I am not able to use a car load in one season, and small quantities cost too much.

We might use two pounds of cotton seed meal in ration number one in place of the Soy bean meal and would change the value of the ration. Perhaps the cotton seed meal could be bought as cheaply as we could raise the Soy beans.

No. 2 is also a good ration. I consider it better than the first. These rations admit of an infinite variety of changes to accommodate them to the different kinds of feed we may have or can buy at reasonable prices.

SILOS AND SILAGE.

(Wm. Plummer, Grace, Mo.)

It seems to me that I am out of place to try to discuss the subject of silos and ensilage before this convention, but as I have been placed on the program, I will try to give my experience with the silo as best I can. I have had my silo built for three years and it has given me the best of satisfaction, but if you could come to Clover Hill Dairy I could show you better than I can tell you, as I like the Missouri idea of having to be shown.

Three years ago I decided to make dairying my business. I had a herd of thirty-two grade Jersey cows of good quality. I concluded that the next most important thing was proper feed for my cows After getting all the information that I could out of Hoard's Dairyman and Colman's Rural World, I called on Mr. Brooks of Cavendish, Mo., and Uncle John Patterson of Kirksville, Mo., and got their experience with ensilage as feed. I decided to build a silo. I built my first silo in the fall of 1900. I built it round, sixteen feet in diameter, and thirty-four feet high, four feet of it was under ground. The silo proper is made of 2x6 pine, 14 and 16 feet long. It is hooped with 13 iron hoops made of ⅝ iron rods. I then filled this silo with corn and with this amount of silage I fed thirty-two cows from the 15th of November till the 27th of April. I also fed some bran and a very little corn and allowed the cows to run to sorghum cane during the day. My cows milked well all winter and in the spring were in good condition. As evidence of the value of my method of dairying, I wish to state that my butter brought one cent more per pound on the New York market than the top price. The dry cows I wanted to put off, I sold for $3.25 per hundred, without extra feed.

In the fall of 1901, I refilled my silo with corn, this time it was mostly fodder and this enabled me to keep sixty-five head of cattle of all kinds through the winter, thirty-four of them cows, without buying any rough feed. I fed a little corn meal to the best milkers.

Bran was too expensive to give sufficient profit. While my neighbors were paying $12 to $14 for hay per ton to keep their stock through the winter, I fed silage raised on my farm; this induced me to build another silo, so this fall I built silo number two, after Mr. Cobb's plan, of Monmouth, Ill.

It is twenty feet in diameter and thirty-four feet high, four feet of this is under ground, made of rock. On the top of the foundation, the staves are 2x4 pine, 14 and 16 feet long, nailed together with 40 penny spikes. This silo is filled with corn and sorghum, about equal parts. We are feeding the silage from this silo now and it gives good satisfaction. I am sure that silage is the best winter feed that I ever fed in Missouri, either for milch cows or for young stock, and hogs will eat it readily and it makes a good change for them.

You can build a silo as cheaply as any other building to keep feed in if you consider the quality of the feed.

Should there be three or four farmers in a neighborhood who would each build a silo, and then buy an ensilage cutter in partnership all could have the use of the one machine and by exchanging work, letting each man have his place at the cutter so that he would work to the best advantage, much time would be gained and trouble prevented. I filled silo No. 2 at the rate of eight feet per day with a thirteen-inch cutter. I used a Deering corn binder to cut the corn, and have the corn hauled in on low wheeled wagons, and each man loads his own wagon. It cost me but 35 cents per ton to put up my ensilage this year and it was hauled from 40 rods to one-half mile. I like ensilage because it is handy to feed and stock will eat ninety per cent of it if it is properly put up. While my neighbors are digging mouldy corn-fodder out of the snow drift, I feed green feed in the dry.

Where corn is made into ensilage it makes more manure and of a better quality. My wheat made ten bushels more per acre this year on the ground where I had spread manure from the stable where ensilage and bran was fed than it did where manure was scraped up from the yard where fodder and sorghum was fed, and on the same quality of ground.

Notwithstanding the criticisms made against the use of the silo in this section of our nation, I have found that it is profitable, and has even done more for me than I anticipated. When a Missouri cow will produce butter that sells for 33 cents per pound, why not feed her silage?

DISCUSSION.

Mr. Patterson: Silos and ensilages are necessary things for making the most profit in dairying and I think they are just as profitable for general stock raising; it makes a good and cheap feed for young stock of any sort, and is no costlier than other feed. Putting the cow peas in the silo with corn is easier than curing the peas and I think it makes a better balanced ration in this way than any other. I could not field cure cow peas this year without losing most of them. I bought a new ensilage cutter and it was delayed in transportation and consequently when the frost came in September I lost ten acres of cow peas. We always have good results from feeding cow peas mixed with corn and other feeds. The silo is the preferable way of feeding dairy cows and the sooner we get to using it the more profit we can make.

The way to fill the silo depends upon what machinery you have. Mr. Rogers spoke of using a corn harvester, I had one and it took the best man I had and three of my best horses and cost me more than to cut it by hand, and lay it down in small piles. We found this a much cheaper way than to harvest with the corn harvester, and I sold my harvester.

Mr. ———: Do you have trouble in elevating your corn with the blower?

Mr. Patterson: Not when we have enough power. We elevate it thirty feet. On our old machine we used an eight horse power engine. That did not give enough blowing power, however, to keep it going on a large machine, but with a twelve horse power we had no trouble.

We keep as good a man as we can get to stay in the silo and he has a six-tine pitch fork and takes what falls in the center and places it all around on the sides, and the more he tramps the better, so we urge him to tramp and keep it higher on the sides than in the center; and it will keep an energetic man busy to keep the sides even with the middle.

Mr. Erwin: I feel like there was a statement made by my friend across the way that ought not to go unchallenged and that is in regard to the value of sorghum. It depends entirely on what you want to grow after you have raised a crop of sorghum. If you want the ground firm so that you can raise a crop of grass and your land is a little inclined to wash and be carried away by heavy rains, there is no crop, in my humble judgment, that is superior to sorghum. It firms the ground just right for the grass—not the clovers, but blue grass and timothy and that class of grasses. It shapes the ground so that weeds are driven from it and the ground is left in better condition for putting on a grass crop; and as to sorghum's taking away the fertilizing elements of the soil, I have very grave doubts. I think if we investigate the matter we will find that crops like corn and sorghum that are largely carbonaceous and must derive a great deal of their value from the sunlight, that they are among the least exhaustive of all the crops that we raise; where the soil is not carried away by the rainfall. The trouble is that we plant on the hillsides where the land is easily washed and the rainfall carries away our fertility and not the crop that we raise on it: hence, I think sorghum, if your land is disposed to wash, is one of the best crops that you can raise, and it is a crop that comes in at that season of the year when we are most likely to have drouth, and we can keep up the flow of the milk, with sorghum as with no other crop. It seems to me more valuable than any other grain crop, as we have it at the season of the year when there is a drouth, and it is a drouth resisting plant and seems to me to be superior to cow peas. Last year I had cow peas on the south side of my field where there is more water; they suffered in the drouth, while the sorghum planted on the north side, where there is less water did not suffer but remained green and furnished green feed for my cows during the dry part of the season.

Mr. Bruns: Plant cow peas with the cane but do not plant too thick.

I think it is doubtful whether sorghum takes the fertility out of the soil more than other crops and if you plant cow peas with it you are just that much better off.

Mr. Rogers: As to sorghum, it is a pretty good feed if you know how to use it. As to its impoverishing the soil, I think we have a preponderance of evidence that it does impoverish the land. All we have to do is to stop and see what it does. We know that it takes everything out of the soil and puts nothing back, that is well established. These Agricultural College boys here understand that.

Mr. Erwin: Just point out how it does not put anything back.

Mr. Rogers: The hard fibrous roots of sorghum pack and firm the land so that if you wish to sow blue grass afterwards, the sorghum is a pretty good thing, but if you want to plow your land, it is hard; but the sorghum takes everything out of the soil, the nitrogen, the potash and phosphorous and puts nothing back. Whereas the pea and clover family, all the leguminous plants in the catalogue take out very little phosphorous, very little potash and put an abundance of nitrogen in the soil. We see those little laboratories for making nitrogen on the roots of the clovers and cow peas; we do not know how they gather this nitrogen, but we know they do gather it. Timothy does not much more than keep the soul and body together in anything that eats it; what we want is clover or leguminous plants of some sort; but I believe that cane is a good cattle feed and firms the soil.

Mr. England: Is cane better than corn fodder? For our work it is no better.

Mr. Bruns: Cattle will just eat the blades of the corn fodder but of the cane they will eat it all. How much more is that?

Prof. Waters: Do any of our sorghum farmers present make the mistake of devoting good land to the growing of sorghum and let their corn fodder go to waste and put in sorghum to make up for it? There is no question but that sorghum ton for ton and acre for acre will produce more feed, but it does not supply any nutrients that corn fodder does not. While I have no war to wage on sorghum, every man should decide whether he can afford to grow sorghum; after careful consideration of all the facts, and first the position is well taken that sorghum impoverishes the soil rapidly; not so rapidly as corn, perhaps, one season with another; and yet it may impovish it more rapidly than corn.

Mr. Erwin: Have any experiments been made and published showing what the impoverishment of the soil is in the growth of corn where the land lies so that there is no mechanical waste by washing; such as is shown in the growth of wheat in England?

Prof. Waters: An experiment made in Pennsylyania in the growth of corn for sixteen years shows very markedly and unmistakably that corn in comparison with wheat, oats and timothy is a very much more exhaustive crop; and in comparison with clover you know what the result is and do not need to refer to any exact experiments. We can find farms in this State that have been practically worn out by the growth of corn. Sorghum does not supply any of the nutrients that corn fodder, which is wasted so prodigiously in this state, will not supply. I do not mean to say that each individual farmer is making a mistake, by growing sorghum, for he needs that sort of material and may not have enough fodder to supply it. For this purpose sorghum is a great crop. What the dairyman needs, however, is a supply of cheap protein to balance his corn, corn fodder and straw. Clover and cow peas are the cheapest sources of protein that we know of, and while he is producing protein in the cheapest way by the use of clover and cow peas, he is at the same time benefiting his land. I think we cannot emphasize this lesson of the value of clover and cow peas too much for every farmer.

Mr. ———: What does Prof. Waters mean by letting the corn fodder go to waste? How would you save it?

Prof. Waters: In the dairy business, by the silo, putting into it as much as is convenient; the rest I would cut and field cure and I am not certain just now whether I would shred it or not. I would let somebody experiment on that proposition, unless I had an opportunity to get the ears husked by the same operation and at only a slight expense above the ordinary method of husking it.

Mr. Erwin: This is my third year on shredded fodder. One year I used the blower and blew the shredded fodder into the barn and into the convenient places for feeding. The last two years I threw away the blower and put on an old fashioned carrier of my own make and ran the hay baler behind it and drove the machine into the middle of the corn field and as fast as the fodder is shredded it is baled. I thought that was the cheapest method I could handle it. It took one less team than to haul the corn to the barn. When shredding in the middle of the field and one team will do the baling and I can haul fifteen or twenty shocks at a load and cover and handle it as conveniently as baled hay. For my horse stock, especially I am no longer dependent on hay for rough feed, but prefer the shredded fodder to the hay, and I find that it makes excellent feed for cows. Then again here in our climate we have a good deal of bad weather for husking corn in the ordinary way and I get my corn husked and in the same operation the fodder baled, so that I have nothing to do in the winter time but feed it out.

Mr. Miller: The best explanation I ever heard in regard to sorghum and corn I got from Prof. Waters. He said farmers have got to raise corn in order to get the ears. Why not take ears and fodder from the corn and leave the sorghum alone. Cut up every bit of the corn. Some people have silos and some have not. Stack your corn fodder like hay if you have no silo. I think that is as good advice as can be given.

Mr. Erwin: If you have sorghum on a high ridge you will have green succulent feed to feed to your cattle, beginning the first of August or last of July and it may be kept until the hard freezing weather comes on, and you cannot have that in corn fodder.

Mr. England: Is it not dangerous to turn cattle into sorghum?

Prof. Waters: Yes.

Mr. Bruns: I agree with Prof. Waters that corn fodder is better than sorghum for the silo, but the corn fodder will not take the place of sorghum to help out the pasture—the fact is I feed sorghum as long as it is not freezing weather. As long as the sorghum is not frozen to ice it makes a juicy feed the same as silage. On thirty cows I have increased my milk eight gallons in feeding sorghum two days. But I believe ensilage is all right in place of sorghum and better for winter feeding.

Prof. Waters: It may be that our experience has been a little unfortunate in sorghum. I want to give in one word the results we have had with it in comparison with half corn fodder and half clover hay, not with dairy cows, I regret to say, but with beef steers on full feed, and in some instances steers that were being wintered. A strong mixture of clover hay and corn fodder gave very much better results than the sorghum. Now I agree with you without hesitation that a ton of sorghum will feed further than will a ton of corn fodder, but instead of putting your land in sorghum if you had put it in cow peas or clover and combined the corn fodder, with them you would get better gains than with the sorghum.

Mr. England: I had some experience in the summer. In one weeks' time while I was cutting my cow peas my cows gained on grass and the cow peas two gallons a day. They did not care for the cane until after it was cured, then they ate it.

I would like to ask Prof. Waters about curing cow peas.

Prof. Waters: The curing of cow peas is a serious proposition. It would not be if we were curing them in midsummer, in July when we cure timothy hay, and when the ground is dry and the weather hot, but in the fall of the year it is more difficult to handle them on a large scale, and yet in the ordinary season we have been able to cure them well enough so that they will make very valuable feed, without any undue handling or any unnecessary expense. We mow them down, practically, regardless of the weather and allow them to cure in the swath as much as we can without serious sunburn or injury from rain and then throw them into rather large shocks. Make them tapering, rather tall and finish curing in the shock. If it rains and a few shocks heat, we open them. Ordinarily we will not have much heating. If it rains the next day after cutting, run the tedder over them while they are yet wet, and if it rains the next day, repeat the operation and tedder them every time while wet. The less handling, the better. You may over handle cow peas and have nothing left of them except to leave them in the field as fertilizers and have a good deal of unnecessary labor. The peas will stand a large amount of rain and look black and still be exceedingly palatable and useful as feed. I verify that statement made to Mr. Erwin.

"WHERE ARE WE AT?"

(W. W. Marple, St. Joseph.)

In this great State of Missouri it is said people won't milk, for two reasons, because they don't have to and because they don't want to. After having been told for years that the task of interesting the Missouri people in the question of dairying was a hopeless one, after being told from time immemorial that among the principal products of the Missouri farm, milk would never be mentioned: to find ourselves tonight in this magnificent building, erected on Missouri soil, paid for by Missouri money and dedicated to the dairy men and dairy women and dairy interests of Missouri, is it any wonder that the first question that suggests itself to us is "Where are we at?"

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I learned sometime ago with the greatest pleasure and satisfaction that this, the thirteenth annual meeting of the Misouri State Dairy Association, was to be held here: but when, a short time ago, a programme was sent to me with an urgent request from your secretary that I would respond to the call in the discharge of my duty, as designated on the program, and when I was further reminded at home that the place of this meeting was the "Athens" of Missouri, the seat of learning, the home of culture, the abiding place of titled dignitaries, the rendezvous of professors, I questioned very seriously the advisability of my taking a part in these exercises.

My abiding faith in the dairy business, my implicit confidence in the good people of our grand old state, and with this as a basis, my intense enthusiasm has prompted me to preach the Gospel of Dairying in many parts of Missouri, to many good sized audiences of very intelligent people, among whom were many well posted along dairy lines. And while I have felt perfectly at home among these people, my lack of any title whatever, I was sure, could not help but make me feel out of place, if not ill at ease here.

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I am reminded tonight that a year ago I had the pleasure of representing the dairy interests of Missouri at the State Dairy Association convened at Palmyra, and in their behalf asked that assembly, the citizens of that hospitable little city as well as our great commonwealth, "Why not Missouri?"

And now after another year of progress in every department of science and every branch of industry and in the interest of the faithful few who started this organization thirteen years ago and who for thirteen long years have fostered and nursed and defended it, I come to you and demand to know from you and from every true, loyal citizen interested in developing the latent resources, preserving the richest heritage, and building up the most important industry in the great State of our nativity or adoption. "Where are we at?"

This may not appeal to you as a very elegant expression. It may not be grammatical, it may not be rhetorical. It may lack poetry; it may seem to you superfluous, but to me it seems full of meaning, full of expression and more impressive than any other language that might be used to ask the same question. It carries me back to the long ago, in the little log school house on the hill, between two creeks, in Macon county. I see the little fellow with his butter-nut jeans suit, his uncombed hair, his coat sleeve glistening from contact with his nose, his hands and face dirty, barefooted and digging his toes into the dirt floor, standing in line, toeing the mark, his eye sparkling with mischief, his great big head denoting brains and intelligence, obscure now but destined to be great: holding in his hand a dog-eared, blue-backed spelling book, thumb marked until you could scarcely read it, and I have heard him say to the teacher, "Where is the lesson at?" I followed him home and when his father told him to go and drive up the cows, I heard him say, "Where are they at?" From that time until the memorable occasion when in the halls of congress that illustrious representative from Mississippi got lost and asked, "Where am I at," giving the expression greater publicity and notoriety and stamping it with dignity, whenever I have heard it, I have always felt that what it lacked in elegance was made up in force.

This may not have impressed you as an important question, but it is. It comes to everybody, in all walls of life. It is asked by everybody, by some often, by many rarely. The bankers everywhere, the trusted conservators of the people, either by personal investigation or through competent and honest employes, every day ask, "Where are we at?"

The merchant prince each day calls the heads of his departments together and asks, "Where are we at?" The country merchant once or twice a year takes a careful invoice, and by so doing he asks, "Where am I at?" The family physician is called in and finds a very sick patient. He looks at the tongue, he feels the pulse, he takes the temperature, he listens to the beating of the heart, he prescribes, he watches the case closely. Satisfactory results are not attained and he calls in counsel and by so doing, he asks, "Where are we at?"

The lawyer takes the case and after the client has given him all the information he can, he takes into his private room all of the witnesses and everybody that is likely to know anything about the case. He questions them and cross questions them. He tests them in every way possible, all because he wants to know "where he is at."

The politician rides all over the state. He talks whenever he can get a crowd to listen to him. When the campaign is almost over and he is completely worn out, with his voice husky, his pocket book empty, his pass worn out, on the verge of nervous prostration, he calls the chairman of each committee from every district large or small, and holds a conference, all because he wants to know "where he is at."

The great political parties print papers, publish books, hire orators, and every now and then they have an election, to see "where they are at."

The minister who stands behind the sacred desk and proclaims the gospel to his congregation. After years of toil to build up a church and to all appearances successful, his audiences always large, the prayer meeting well attended, the Sunday School full of interest, hundreds of new names on the church roll and yet some bright Sunday morning when the attendance is large, he says to his congregation, "Everybody who is trying to be good, please stand up." He wants to know "where they are at."

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Ladies and gentlemen, I care not whether you are in the dariy business or something else, I care not whether you live in the country or in town. It is of no importance or special significance whether you are engaged in farming or banking or manufacturing, you are no less interested in this connection at this time, and as it pertains to dairying, in view of prompt action being necessary, you must ask yourself and answer the question before you are in a position to act intelligently. The banker, the merchant, the speculator all ask themselves every day and I am glad the time has come, through the influence of such institutions as this, when the same business methods are adopted by the farmer to obtain satisfactory results.

It was not always thus. In some sections during the tobacco raising period, when we bought Horse Shoe seed and raised Battle Axe tobacco, when we spent valuable time picking worms and pulling suckers off of tobacco plants, and in our tobaco patches there were two kinds of suckers, one grew on the plant and the other pulled them off, we never asked where we were at. And we never knew until the sheriff brought us word, and then we saw our mistake and none knew better than we that it was too late.

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We owe a debt of gratitude to the pioneers of this business, the originators and incorporators of this association, and I wish tonight that I could answer them this question by giving a detailed report of what has been accomplished during the past year.

I am glad to report that over a thousand residents of this state have espoused the cause of dairying during the past year, and are abundantly satisfied with the result.

A man who had a gold mine on his farm or an oil gusher beneath it, that would not allow the space to be used necessary to get it out because it would interfere with raising corn, would be examined by a committee in fifteen minutes to decide on his sanity. And yet on thousands of Missouri farms there is a veritable gold mine of rich yellow butter, or a gusher of pure, rich milk in the wealth of the blue grass that covers the land. And some men won't even let their wives and children work the mine.

You have been told too often to need repeating of the wonderful revenue of our sister state, Iowa, on the north, from her dairy product. But I want to add to this that after making butter for years and bringing down to Missouri to sell, a thousand of those men came down into our own beloved country during the past year, with their pockets bulging out with the revenue from the dairy, and bought at what we considered a high price a thousand of these farms on which were gold mines. A thousand better dairy farms than they ever saw and have sent our people south and west to Oklahoma. And simply because they have never asked themselves the question, "Where are we at?"

Last Monday morning a hundred thousand traveling men left their homes in the discharge of their duties, as they scattered in every direction and tonight a hundred thousand wives and three hundred thousand children are asking, "Where are they at?"

Tonight there are fifty thousand homes desolate, where food is scarce, clothing is scant, and the coal bin is empty. The wife and children are shivering with cold and starving with hunger. The husband and father is gone, and with trembling voices and tearful eyes, this host is crying, "Where is he at?"

Did you ever stand on the platform of the depot and watch a railroad train come in? It's a beautiful sight and we never get tired of seeing it. The engine, the baggage and express cars, the coaches, the dining car, the sleepers, all works of art. There are many employes on this train, each performing his special duty. The most conspicuous and the one who seems most important is the conductor. When the train stops he gets off and walks along the platform with the impression that that is his train, and with a bearing and carriage that would indicate the whole road was his. He wears a uniform that is perfect in fit and not a spot on it. His shirt front is immaculate, his diamond pin dazzles your eyes. He wears a beautiful cap. His patent leather shoes are a perfect mirror. His hands are soft and white, his hair is parted in the middle and his moustache is curled to perfection. He is the observed of all observers, he is the envy of all the boys. He is admired by all the ladies. In fact he is monarch of all he surveys. In the glitter of this man's apparel and in view of his conspicuous position, we lose sight of an important personage connected with that train. It is the engineer.

I view him with perfect admiration as he sits in the cab of this majestic engine, as it stands puffing and blowing and letting off steam and throwing out great rings of black smoke. He is clothed in overalls and jumper and his face is covered with soot and as the train speeds over the plains, bearing its load of human freight, he sits there with one eye on the track and the other on the clock, his hand on the throttle holding the destinies of these dependent mortals and guiding them safely to their destinations, by always knowing "where he is at."

The young man who reads the account of naval life with all its exciting experiences, decides he wants to join the navy. He prepares himself, stands the examination, is accepted and begins his life on the mighty waters. The little community is all excitement over having furnished some material to protect our coast. In their estimate he is a wonderful man and everybody discusses him.

Under the influence of martial music, during the excitement incident to getting recruits, fascinated by the faultless attire and athletic shape of the recruiting officer, hypnotized by the wonderful stories of the U. S. soldier and desirous being lionized by his community, the young man leaves the store, the counting house, the farm and joins the army. The time comes for his departure and a public reception is held. Eloquent speeches are made about his bravery. Tears are shed. Everybody shakes hands, and half the people kiss him. He is besieged with bouquets and bears with him the good wishes of everybody and feels his importance as he leaves, listening to the music of a dozen young ladies singing "Good Bye, My Lover, Good Bye."

While I would not say a thing to detract from the glare and honor and distinction of these young men, I want to call your attention tonight to the bravest of them all. He is the young man who sees all this, who bears all this in response to the call of duty, in accordance with the admonitions of conscience, in compliance with existing conditions, for parents' sake, in the interest of brothers and sisters, he stays at home. No bouquets thrown at him, no eloquent words of commendation for his decision. No hand-shaking, no kissing, no band of music, no banquet, no hurrah, no excitement. He quietly remains on the farm, surely conscious of having done right. He listens to the occasional song of the meadow-lark as he cultivates his crop, and at night, as he milks the cows, is reminded of the time by the song of the whippoorwill and the occasional hoot of the owl.

To me there is no greater hero, energetic, dutiful, conscientious and self-sacrificing. It is in his interest that I come to you tonight and ask your assistance to keep him there and encourage more to go there. The boy on the farm where the air is pure, where the moral atmosphere has never been contaminated, and where the beautiful picture painted by divinity in full and constant view of the occupant of the farm, has enlarged his soul and stamped on his innocent face—satisfied. The boy, the young man full of ambition, full of desire for more knowledge, who has not yet tasted of the bitter fruits of failure, who knows no limit to his strength and with his eye on the top round of the ladder of fame, with an ambition that cannot be curbed, impelled by an active brain, that is fed with good, rich, pure blood, on and on toward the goal that has never yet been reached, finds in the dairy business a field for thought, room for expansion, not the hope of reward, but the reward itself in immediate results and as he continues to get results that are financially satisfactory, he is at the same time developing his mind and preparing himself for a higher degree of enjoyment. In the country's need from any cause, it is of them they speak when they cry out in their distress, "Where are they at?"

I heard of a man in Kansas who was opposed to the dairy business and yet permitted his wife to support the family from her cows and I read with pleasure an account of his going to Dakota a short time since. While up there he was looking at a piece of land and wandering over it, he fell into an old well which was very deep. They immediately wired his wife telling her of her husband falling into the well and asked her what they should do. She immediately wired back, "Fill up the well."

To this association I would say, "Don't give up the ship." To all Missouri I would say, "Keep up the good work; finish the work already begun."

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In behalf of our very competent and worthy Professor of Dairy Husbandry, Mr. C. H. Eckles, who has manifested such deep interest and has done such effectual work, in behalf of these faithful members of the Missouri State Dairy Association, in behalf of the people of Missouri who have built this magnificent structure and secured a man to make good use of it, in behalf of our Board of Agriculture, in behalf of Mr. George Ellis, the worthy secretary, in behalf of the men who worked so hard to make this meeting a success, in behalf of Missouri's butter makers, in behalf of our mothers and sisters, in behalf of one hundred thousand boys on the farm, in behalf of the man who had the courage of his convictions and went before the Legislature and Legislative Committees, who worked with might and main and succeeded in getting the appropriation for this magnificent structure, your esteemed and honored citizen, Dean Waters, in behalf of the Commonwealth I appeal to you tonight that you will ever and anon keep putting this question and demanding an answer, "WHERE ARE WE AT?"

WHAT WE PROPOSE TO DO IN THE DAIRY DEPARTMENT OF THE AGRICULTURAL COLLEGE.

(Dean H. J. Waters.)

I naturally feel some hesitation in attempting to answer this question because, like President Jesse and Secretary Ellis, I am not a dairyman, and it would be more proper for Professor Eckles, who has charge of that Department and is a specialist along that line, to undertake to tell you what is proposed to be done by the Agricultural College in dairying. I want to say, however, that as far as I am concerned and as far as the Agricultural College is concerned, we have an abiding faith in the dairy industry and believe that it is permanently established in Missouri; that it will develop and grow so that in a very short time Missouri will be an important dairy State. I do not mean that we are looking for any great boom along this line or that this industry is likely to have a mushroom growth; it is not best that it should, neither for the State nor for the people who are connected with it. The industry should grow gradually but steadily and grow with the experience and with the success of the men who are engaged in it.

In assisting in the development of the dairy industry, the College will have no occasion to relax its efforts in behalf of the other live stock interests. There should be no conflict between the beef and dairy interests. They are working to the same end and accomplishing the same general good, viz., the establishing of our agriculture upon an enduring basis. No community, state or nation has ever built a prosperous and enduring agriculture upon any other foundation than that of live stock, where the chief products of our fields and pastures are marketed in some form of live stock and the fertility retained to fatten the soil. The long continued selling of hay and grain will bring depleted soil and an impoverished people.

It will therefore be the chief aim of the College with the assistance of all stockmen to bring the grain farmer to realize this permanent success lies in the line of animal husbandry. It may be special dairying or special beef making or it may be a combination of the two in which the high priced butter fat is sold as butter and good beef calves are raised on such cheap material as skim milk and corn meal.

As far as the special work in dairying is concerned, we feel that the College, with its new dairy building and apparatus, with its herds of dairy cows, with its trained faculty, with our faith in the future of the industry and enthusiasm for its success, is in position to render valuable service to the State.

While the impression still prevails in many quarters that the creamery or dairy is the best and practically the only place to learn dairying, I assert without the slightest fear of successful contradiction that in a school of this sort this subject may be learned much better, vastly quicker, at far less expense and incomparably better than is possible in a creamery or dairy. I do not mean to be understood as under-estimating the value of practical experience, but experience added to good training in an agricultural college will be far more certain to bring success than will either alone. In fact the time has come when such education is necessary and a young man cannot hope to succeed as he should, without it.

This work will be directed along two distinct lines, viz., instruction by the College and investigation by the Experiment Station.

First. The instruction will be sufficiently varied in its scope and character to reach all classes from the man who plans to fit himself for the highest position the industry offers to the man on the farm with a cow.

Here instruction in dairying is put upon the same plane as instruction in Latin, Mathematics, Economics or any other of the old and well established University subjects and where it will have the same dignity, the same importance and the same educational value.

Three courses in dairying are now offered as follows:

1. A four years' collegiate course.
2. An eight weeks' course for creamery operators.
3. A twelve weeks' course in dairy farming.

These courses cover all of the practical details in butter making, cheese making, milk testing, dairy bacteriology, judging, selecting, breeding, feeding and managing dairy herds; and ample experience in the handling of dairy machinery, making, judging, packing and marketing butter and cheese. In addition to these purely technical courses, instruction is offered in farm crops, manures and fertilizers, farm buildings, poultry raising, horticulture, carpentering, blacksmithing, steam fitting, etc.

The College is not satisfied to limit its efforts to instructing the students who present themselves at the University for this work. Prof. Eckles attends as many of the farmers' institutes held under the auspices of the State Board of Agriculture as his duties at the College will permit, to give to the practical dairymen in their own neighborhood such information, advice and assistance as he can.

Arrangements are now almost perfected for equipping a car with the necessary apparatus and material for practical demonstrations in butter making, judging dairy animals, etc., with a view to holding dairy meetings in such parts of the State as may be most interested in this study, in other words, the holding of a practical dairy school in every dairy community in the State. Unfortunately the bulk of the butter produced in Missouri is made on the farm with appliances and under conditions that practically prohibit that uniform quality and high grade that best meets the demands of the market. If by the work at the institutes and with the traveling dairy car the quality of the farm butter shall be improved so that its selling value is increased only a cent a pound, the direct benefit to the State will be more than the entire effort to build up dairying has cost since it was begun by this Association thirteen years ago.

Second. Investigation by the Experiment Station. The whole range of butter making, cheese curing, feeding of dairy stock, comparison of different grains and forage plants for milk production, the raising of calves on skim milk, the best use to make of the by-products of the dairy, in short, any of the important problems that are now confronting the dairyman will receive careful attention.

I hope that the dairymen of Missouri will feel that the Dairy Department of the college belongs to them and that they are free to call upon Prof. Eckles for any assistance that he may be able to render them and that the success of the new dairy school rests partly with them and partly with us. I trust that we may continue to have your hearty co-operation and assistance to the end that we may develop the greatest dairy school in the greatest dairy State in the Union.

BUTTERMAKING AS A PROFESSION.

(Prof. G. L. McKay, Iowa Agricultural College.)

Mr. Chairman:

This is an age of combinations and concentration of capital. It is also an age of specialists. The general purpose man must necessarily fall to the rear. Every man should be educated along some line of business. While I am a strong believer of adaptability, I can not think that the man who has made a success as a specialist would have made a failure at any other business if he had applied the same energy and thought to it.

Success in any business never comes by chance or luck. Chauncey Depew, being asked by a young man what was the secret of success, replied: "My boy, there is no secret to it. It is just dig, dig, dig." Edison, being asked to give the definition of genius, answered: "Two per cent. is genius and ninety-eight per cent. is hard work." On another occasion when this great inventor was asked if he did not believe that genius was simply inspiration he replied: "No, Genius is perspiration." The editor of a western newspaper sent to all the successful men in his city this question: "Why is it that not more of our young men succeed?" And one answer came in this laconic phrase: "Because too many of them are looking for white-shirt jobs." Possibly this was a homely way of saying it, but it is true in many cases, especially with many of our college graduates. Some imagine that because they have a college education, they must necessarily get an easy high-salaried position. It is well to have a technical education but it is also well to have a manual training. Lord Bacon says: "Learning should be made subservient to action." We need a knowledge more of how to do things than how to explain things. The world today is looking for men who can turn out the finished product.

The time, we hope, is past when it is considered a disgrace for a man to work with his hands. No man would be so irreverent as to say that the man, Christ, was lacking in brain power or in manliness, yet we find him a carpenter, toiling with his hands.

Study the lives of all successful men and the story will be found in each case exactly the same. The methods vary as they must, but the actual basis of every successful life is the persistent hard, hard work of years and many a personal sacrifice. This is not always apparent simply because we are all too apt to look at a man when he has achieved his success. But there was a struggling period.

Thoroughness in everything is the keynote of success. As Mr. Bok, the distinguished editor of the Ladies' Home Journal, says: "A thorough workman never says, 'There that will do' but 'there, that is it.'" And this is what every young man in business should learn: that absolutely nothing is good enough if it can be made better, and better is never good enough if it can be made best. We frequently hear men complain that there is no use in doing extra work, that their employer does not appreciate it. They work merely like an automatic machine with no interest or heart in their work. As a rule the fault is more often with the employed than the employer. There are exceptions to this as to any rule but as a general thing a man gets paid about what he is worth. The man who most loudly complains of being underpaid is frequently the man who is overpaid.

I find it much more difficult to get men to fill the high positions than it is to get men for ordinary positions. A. T. Stewart used to say that he had always plenty of vacancies in his store which he could not fill, although he wanted to, for $10,000 employes. The same condition exists today in many other branches. Let an important position open in any branch of business and it is very difficult to find a competent man to fill it.

A universal precept and rule of success which, spoken long before Universities were thought of, applies to academic studies as it does to every action and decision of human life: "Whatsoever thy hand findeth to do, do it with thy might." No work is worth doing badly; and he who puts his best into every task that comes to him will surely outstrip the man who waits for a great opportunity before he condescends to exert himself. We are not all adapted by nature to be physicians or lawyers, so it is well for the young man to find the line of work for which he is best adapted, and then use all his energy to make it a success.

The creamery business of today opens up a large field for intelligent young men who are not afraid to work; men who are willing to work with their hands as well as with their head. In fact the man who successfully operates a creamery must be an all around good fellow. The dairy business is practically in its infancy. We know very little about milk or its production. I think it was ex-Governor Hoard who said that the laboratory of a cow was one of the darkest places in the universe. The success of the creamery depends more on the buttermaker than anyone else. Many things that to the careless maker seem of little importance, to the intelligent maker are of the greatest importance. This condition is quite evident to any one who visits a large number of creameries. In some creameries we find every evidence of prosperity. The maker meets the patrons with a "Good morning" and a pleasant smile, and weighs and samples the milk as it should be done. The creamery is in first class order and there is a pleasant atmosphere everywhere. It is a pleasure to visit such a plant. Contrast this with a creamery where we find everything in a dilapidated condition with an untidy maker at the head of it, patrons dissatisfied and the complaint is made on every side that creamery business does not pay and the patrons think that creamery men are among the greatest rascals in existence. This is what is preventing the creamery business from progressing as it should. Jealousy among farmers has destroyed more creameries than all other things combined. More faith in mankind is needed. I believe there are very few dishonest men in the creamery business. If one-tenth of the dishonesty that is printed in the sensational papers was true, the business of the world would be seriously affected.

When we consider that only five per cent. of the world's business is done on a cash basis, we find that business men must have faith in mankind. How frequently we hear farmers in a community find fault with the creamery in their section and do everything they can to injure the operator's business, when in reality the very presence of a creamery in their neighborhood is enhancing the value of their land from $3.00 to $5.00 an acre in many cases.

With your permission I will review the butter business from the time the milk is received up to the finished product. The weighing of milk, which seems of little consequence to some makers, is a very important place in a creamery, and a place where the head maker should always be found in the morning. Here is the opportunity of coming in contact with the patron and doing missionary work that will educate him to furnish a better product. It also gives the maker a knowledge of the condition of the milk that he is to handle that day. The importance of taking a correct sample of milk is quite an item in keeping patrons good natured and satisfied. More dissatisfaction exists over the testing than any other business in connection with the creamery. If milk is allowed to stand only a few moments in the weighing can, and a sample is taken without carefully stirring in the cream, the result will be an inaccurate test, which may defraud the patron or the creamery. The leaving open of the milk jars as frequently happens, after samples are taken, will not give accurate results as evaporation of moisture is taking place all the time. I have known samples of this kind to cause a variation of two per cent. Take up the question of testing milk. The testing machines must run perfectly smooth and at a certain speed to insure correct results. Sulphuric acid should also be of a certain specific gravity. These things require skill. The heating of milk for the separation is not receiving the attention it should. It was my privilege at the great National Convention to try and point out the defects in the butter exhibited. I found possibly from thirty to forty per cent. of the flavor was injured more or less by the use of live steam for heating milk. It was an easy matter in most cases to select the butter where live steam had been used before reading the method of making, many using the exhaust steam from engine to heat the feed water for boiler. Here we found the cylinder oil transmitted to the milk from the boiler, this giving a decided oily flavor to the butter. The use of boiler compounds showed injurious effects also. Why live steam should be used for heating milk at the present time is a mystery to me. Many of the live steam heaters not only injure the flavor by transmitting impurities from the boiler but the heating is not sufficient to give the best or the desired results. The heating of milk helps the fluidity of the fat globules. The quick, flashy heating of milk has very little effect on the fat globules. Therefore the separation of milk is not as perfect. Milk should be heated for some time before separation to get the best results. There is still room on the market for a good heater. The centrifugal separation of milk is a wonderful process. Think of a separator bowl making from six thousand to ten thousand revolutions per minute. Here we see sweet milk put in the machine and skim milk and cream immediately separated. Most any separator will skim clean to a certain limit if the machine is run perfectly smooth and at the proper speed. A little vibration of the machine causes a remixing of the cream and no separator will skim thoroughly clean that vibrates. This is where some makers in large creameries lose possibly more than their wages. The next thing is cream-ripening, which is possibly the most important step in the whole process, as this is a factor that largely controls the flavor, and flavor is the quality that distinguishes butter from lard, tallow or any other fat. Flavor does not come by chance. Take the National six-month contest just ended and we find that John Sollie of New Sweden, Minn., got an average score of 98.12. This was not brought about by chance nor entirely by the good milk furnished by the patrons. This maker informed me that he carried as many as seven or eight starters during this contest. Here we find him selecting the kind of bacteria that produces the best flavor. A starter of any kind is only adding enormous quantity of a species of bacteria that we expect to predominate in the final product. This takes skill and hard work on the part of the maker. Starters of any kind are quite difficult to carry forward, as every detail must be attended to punctually. The maker must also have smell and taste well cultivated so that he will be able to detect the slightest change or off-flavor. He must also have some knowledge of the principles of bacteriology. A few years ago, it was largely chance-work for a maker to win two high scores in succession. Now we find makers who use pure cultures and have a knowledge of the scientific principles of cream ripening, scoring high in most every contest. It is asked, does all this care and trouble pay? I would say "Yes," as the value of the butter may be enhanced as much as two cents per pound. The churning and working of butter is another important factor which does not receive the attention it should from the creamery men of the country. We have a law limiting the per cent. of water in butter to sixteen per cent. yet we find the chemical analysis of butter in the six-month contest is something less than twelve per cent. The maker who is able to incorporate between fifteen and sixteen per cent. of water in his butter will increase his yield nearly four pounds to the hundred. Take an ordinary make of 500 pounds per day and we will have a difference of twenty pounds. Twenty pounds at twenty cents per pound will give us $4.00, quite an item on a man's wages. Here is where skill comes in.

The dry butter or that containing a low per cent. of water does not sell any higher than the medium and in some cases not as high. I tested butter in the London market and found the French rolls and Danish selected which sold highest in the English market to contain about five per cent. more water than the New Zealand butter which brought three or four cents per pound less. In this case the New Zealander was losing four or five pounds of butter per hundred and also losing in price. I asked Professor Siegleke why the Danes incorporated so much water in their butter and he answered that butter was supposed to be plastic and intended to be spread on bread. While I do not like to see the slushy butter, I think that from fourteen to fifteen per cent. of water can be incorporated with good results. It is almost impossible to form any conclusion of the amount of water butter contains by the looks of it. Frequently butter that seems slushy will contain very little water under chemical analysis. Prof. Stork has been working on this subject for a number of years and he has been unable to fully explain why some samples of butter have a very dry appearance and at the same time contain a very high per cent. of water, some samples testing as high as eighteen or nineteen per cent. We do not know when a lot of cream is churned at a time that the over run will be much greater than when a small quantity is churned. This is possibly due to the fact that when a small quantity of cream is used the fat globules are thrown together more compactly and do not hold the same amount of water, as when a large amount is churned. There are several other conditions that influence the yield, which the skilled maker understands. A large creamery cannot place an accurate estimate on a good, intelligent maker. We have one large creamery in Iowa that is getting as much as one and three-quarter cents per pound above western extras for their butter. They could pay $3,000.00 per year and still have a big profit left.

Employers frequently do not realize the value of a good buttermaker. In any ordinary large creamery a maker could lose as much as $100.00 per month without the employer knowing it, and in some cases the maker being able to detect the cause. A few years ago while traveling on the train I got interested in a gentleman's tale of woe about the trouble they had in their community in closing up their creamery. I got so interested that I finally purchased this old plant and I will say right here it would take a very strong tale of woe to make me purchase another one. However, I fitted up this old plant with modern machinery and placed a young man from the college in charge. I had implicit faith in his ability. It was a very difficult field in which to put any maker as co-operative creamery had made a failure and a private individual had made a failure. Nevertheless this young man went among the people with a pleasant smile but with a strong determination to build up the business and he succeeded beyond expectations, thus showing what the right man will do in the right place.

Afterwards this young man left to take charge of one of the largest plants in Iowa at $1,200.00 per year. We did not think we could afford to pay such high wages so put on a cheaper man. The result has been disastrous to our income as well as to the patrons of that creamery. Not many months ago this same young man was offered $1,800.00 per year as buttermaker, thus showing that the services of good men are usually appreciated and rewarded accordingly. If you have a good maker, do not wait for him to ask for a raise, as a $5.00 per month raise given unsolicited will be more appreciated than a $10.00 raise demanded. The creamery business today needs the best talent that can be secured. College graduates should not hesitate to take up this line of work as there is certainly a bright future for highly skilled workmen who are adapted for this business.

WHAT MAY MISSOURI CREAMERIES DO TO INCREASE THEIR BUSINESS.

(J. E. Brady, Kansas City.)

Mr. President, Members of the Missouri State Dairy Association, Ladies and Gentlemen:

The subject assigned to me, "What May the Missouri Creameries do to Increase their Business," is one that might be elaborated on to such an extent that the business of this convention would be obstructed. In fact there are such a great number of things that could be done to increase the business that it seems advisable that I should speak only of the more important ones.

Missouri, as has been stated by nearly all speakers at conventions for several years, has a natural adaptability to the dairy business that is not excelled by any state in the union, and that is equalled by few. It also has splendid markets at home, and by reason of exceptional shipping facilities is accessible to the best markets of the world.

With the advantages just named, it is not stretching one's imagination to say that the possibilities are unlimited.

A way for the creameries of the state to enlarge their business is to create a larger dairy sentiment.

Sentiment, in my opinion, has more to do with the business of this country than any other thing. It matters not whether it is stock raising, money markets, agricultural markets, live stock markets, butter markets, legislation, or what not.

Let a few fellows in a community start to raise Angora Goats; next thing you know the entire community has the fever and is ready to follow the procession.

Again, for example, we will say that there is an agitation calculated to effect some pending national currency legislation. A few fellows on Wall street will go together, discuss the outcome, decide to restrict loans. This action is heralded throughout the country by the press and as a result there is a disposition to withhold credits on all sides. The result is a panic, but it is brought about by sentiment.

During the drought of the summer of 1901, there was a feeling among live stock dealers at the leading markets that nearly all live stock in this territory would have to be marketed to prevent starving. The result was first a weak feeling and then a stampede, you might say, to get prices down. The result was, prices were forced unnecessarily low, and sentiment did it.

Let a few butter dealers in any large market say they think butter ought to be higher as a result of existing conditions. They back up their opinions by making large purchases. Then there is a general rush to buy. This forces prices up; yet after all it was simply the opinions or the sentiment of a few, that did it.

The same thing that enters into all these things can be used in enlarging the creamery business.

It was for the purpose of putting more confidence into milk producers that the Grout bill was passed. With the passage of this bill it was expected that the farmers of the country would have such confidence in the permanent stability of the butter markets that there would be an incentive to go into the dairy business. In other words, it was calculated to create a larger dairy sentiment. The same motive prompted those interested to ask the State Legislature to appropriate $40,000 to build and equip at Columbia the most complete and finest dairy building in this broad land. The same desire to create a larger dairy sentiment caused those interested to have established the Chair of Dairy Husbandry, at Columbia, so that dairy knowledge might be circulated throughout the state by means of institute meetings, bulletins, and experiments at the dairy college.

Some of the ways in which sentiment can be made to increase the dairy business of the state are: There must be confidence and a spirit of co-operation between the creameries and the patrons. Each creamery should make a special effort to interest one or more of their most practical patrons to adopt a profit and loss account of their dairy business. Get them to weigh the milk produced by each cow; make tests of the individual cows; weigh the feed. When you can get them to do this you have an object lesson for the balance of your patrons, that is sure to result in good for the creamery. Others will drop in line, and before many seasons have passed, you will have a large list of practical dairymen as patrons, who will add to their herds as they are able to handle them. With this favorable sentiment created, it should be fostered by handling patrons so that you will retain their confidence. This done, the business will show a healthy growth each season.

SOME PHASES OF BUTTER-MAKING.

(Prof. E. H. Webster, Kansas Agricultural College.)

It is with pleasure that I meet with you today, and that pleasure is made doubly great through the fact that there are here on the platform those under whom I received some of my early lessons in butter-making, and whom I am still glad to call my teachers. I refer to Prof. McKay, of Iowa, and your own Prof. Eckles.

I do not propose to give you a lot of advice. In doing that I should be reminded of the saying of Uncle Remus, "Whenebber one gibs me a whole lot of advice, I can't help suspicionin' that if his opinions were so valuable, he would be somewhere else countin' his money."

If the butter-maker needs consolation let him turn to the 15th chapter of Job, and read between lines as follows:

"The butter-maker that is born of woman, is of few days and full of trouble; he cometh forth like a flower and is cut down, he fleeth also as a shadow from an irate patron, and continueth not long in that land. And dost thou, oh! commission man! open thine eyes to such a one and bring him unto judgment with thee? Who can bring clean butter out of unclean milk? Not one." Job must have been a butter-maker, and he had a retinue of consoling friends, which were very much like their cousins in this latter day. This is another reason why I will not presume to give you advice.

If, however, there is anything in my remarks that will help any one of you to see a little more clearly the relation of things, anything that will help you over a tight place, or if I can hold out a ray of hope to some one who now sees through a glass darkly, the time will not have been lost, and I shall have another reason for being glad that I am with you.

It is a grand thing to have an ideal, a high ideal, and yet in our striving after such a conception we are all too apt to lose sight of the stubborn facts that surround us. By the "we" here, I mean the class of dairy writers, which includes myself, who are always telling how to make good butter out of good milk. You men who are up against it every day know, and recognize the facts, and more than one butter-maker has said to me in the past few months, "This is my position, what can I do?"

Were an attempt made to define butter-making, as all too many of our creameries are compelled to practice, it would read something like this: "Butter-making is the art of making very good butter out of very bad milk."

A few years ago, when the financial standing of Kansas was not so bright as it is now, one of our senators wrote a book called "The Way Out," or more popularly it was known as "Peffer's Way Out." The butter-maker will rise to bless the man who will write a book pointing to the butter-maker's way out. Let us pause to ask if there is a way out. Just as the dairy writers had everything fixed, and had settled down to giving regular advice on how to improve the milk supply, most of which was good and applicable, thinking no doubt that was the only unsolved problem in the Dairy Arithmetic, there came up a cloud above the horizon not bigger than a man's hand at first, but it grew and grew, and grew until the storm was on, and into what had hitherto been a peaceful dairy community, was thrust the farm separator. I say once peaceful, for now the butter-maker backed by the creamery papers opened war on the invader. The agent was there for business and he at once proceeded to show the patrons how they could save money in all kinds of ways, deliver their cream every other day, or three times a week, and then if home creamery wouldn't pay it just ship it somewhere else and get more money than ever for it. This is where we find ourselves today, and we can justly consider "Where we are at."

The proposition before some dairy communities may still be, shall we adopt the hand separator, but with most of us in this section of the dairy world, we can sympathize with "Mike," who was visited by the physician when he had a very bad cold, the good doctor began to tell Mike what he should have done to avoid the cold, he should have taken one precaution and another, until Mike could stand it no longer, and he broke in, "To the divil with the larnin', ye can be givin' me no post-mortem, it's me cold that's a troublin' me."

And so it is, we are confronted with a fact and not a theory. That fact is, poor cream from hand separators, and skimming stations. How can we best handle it to get the best results? I do not wish to spend time in discussing the work of educating the farmer by means of dairy institutions, the dairy press and such similar lines of work. These agencies are all very much alive, and are doing what they can, to right the problem of bad milk and cream. Every butter-maker and creamery manager should give these forces for good, his unqualified support.

One of the surest aids in the direction of the improvement of the milk and cream at the farm is, to call bad milk, bad milk, and bad cream, bad cream. That creamery which will take in everything alike and pay just the same for bad stuff as for good is doing more to counteract the good that dairy education is doing for the improving of the products, than any other one thing. Grade the cream and pay for it according to its worth. This is not an easy task to do, and the man who is to do this grading will have to be a more than a $25 or $30 man. There would probably have to be some grading among the men if such a system were adopted, but if a new man is needed and costs more money make the fellow that persists in bringing in the poor cream pay the difference. I hear some of you in my mind's ear already saying that it is impracticable, perhaps, it is for you, but one will rise up and take your place who can make it practicable.

In grading this cream there is one excellent way of determining firsts from anything else, that way is to buy a good pasteurizer, and allow nothing to go into the firsts that you cannot pasteurize. On the side, I will say that this is the easiest way to convince the patron that he must bring good cream. You can draw the line very close, for you cannot pasteurize any but the best cream. The balance can easily be thrown into two grades, medium and very poor.

This work at once calls for a high class of butter-makers. A thorough understanding of the starter question must be one of the first requisites. Creamery managers must see that their butter-makers are provided with the very best facilities for this work, and that the butter-maker has time to do the work properly. With this knowledge of starters the way is clear for the good cream. The question naturally arises, what can be done with the second and third grade stuff. Under the best of handling this will not make the best butter. We can do much to improve it, however. If there is not too much of it, it can be washed and benefited greatly, by this I mean reducing it down with water to six or eight per cent. and re-separate it, and add some good milk and 30 per cent. starter. Where there is too much of it to make this practicable, it can often be greatly helped by adding from forty to fifty per cent. starter and thus in effect drown out the bad flavors. Where the first method is used, that of re-separating, the resultant cream can be pasteurized and added to the best cream, but still it should carry the stamp of second grade cream and be paid for as such, because of the extra work required to bring it into anything like shape.

There is another phase of butter-making of which I wish to speak. That is the matter of reducing everything to a perfect system. We have generally ripened our cream until it tasted right, cooled it to about a certain degree, churned it next morning, sometimes at 50, sometimes at 60, consuming anywhere from ten minutes to three or four hours. have sometimes added ten per cent. starter, sometimes thirty per cent. and at other times none at all. We have churned a twenty per cent. cream. and a forty per cent, just as it happened to be. We have sometimes ripened at sixty, sometimes at seventy or higher, sometimes we have worked the churning fifteen revolutions, sometimes twenty-five, in a room sometimes at forty, sometimes at ninety degrees, sometimes compelled to rush the work through and at others had abundance of time, never knowing the amount of butter fat in the vat, and never knowing what our over-run was. Were I going to give you any advice at all before sitting down, I would say, "Don't do it. Have a system, work to it." The market demands uniformity in quantity almost as strenuously as it does high quality itself.

In one of the great creameries of the country this miscellaneous assortment of variations is not allowed. They work on absolute system. The result is a far greater degree of uniformity than was obtainable before introducing almost rigid rules of this kind.

It may be objected that in small creameries this cannot be done. My answer is that a larger part of it can be done. If the creamery is supplied with the Babcock tester, an alkali test and a good thermometer there is no excuse for the butter-maker not knowing the amount of butter fat, and bringing his cream to a standard both for fat and acidity. He can establish a churning temperature then very easily, that will bring the butter to granules in from 30 to 35 minutes. With an even percentage of cream, and ripening, and a uniform churning temperature, he can easily determine the amount of working necessary to give just the right grain. With all of these things known and followed from day to day the result will be very uniform.

The over-run, the most important part, considered financially, should be known every day. A thorough system and a properly ruled sheet of paper for filling in data will enable the butter-maker to know this.

I am going to give one word of advice, if you will allow me to break my former statement. If there is a butter-maker here who feels that he hasn't enough grasp of the subject to enable him to carry out the ideas suggested, get a move on you and attend the Missouri Dairy School this winter. Prof. Eckles is abundantly able to help you out.

MILK FEVER.

(By Dr. J. W. Connaway, Veterinarian of Missouri Experiment Station.)

Mr. President and Gentlemen of the Association:

I shall give most of the time that has been alloted me to the consideration of *prevention* and *treatment* of the disease mentioned in the program, and especially to a demonstration of some of the practical methods employed. Most of you have been in the dairy business or have handled cattle a sufficient length of time to scarcely make a mistake in the diagnosis of milk-fever; for this reason and for lack of time I shall touch only briefly upon the causes and symptoms of this malady.

Milk-fever, or parturient paralysis, as it is often called, occurs as a rule only in heavy milkers or those in high condition—the attack occurs in the majority of cases a few hours after calving (in rare instances previous to calving or even several days after). The parturition has been easy and the after birth passed entire. The first symptom the attendant is likely to notice is a staggering gait from weakness of the posterior limbs—later the animal goes down, may rise but soon falls again, later becomes delirious and unconscious; there is also a loss of vision, the eyes have a glassy stare and the power to swallow is also diminished.

As a preventive measure it is well to put the cow on short rations for a week or two before calving, and return to the customary ration gradually. In some cases the udder is so greatly distended before calving as to give much discomfort, and this condition should be relieved by withdrawing some of the milk.

In regard to treatment the methods one pursued were very unsatisfactory, a large percentage of the animals succumbed to the disease. A new treatment has been introduced, however, which is almost a specific against this disease. I refer to the treatment introduced by the Danish Veterinarian, C. Schmidt, and commonly called the "Schmidt treatment." This method has been used extensively in the dairy districts of European countries with the best of results. The veterinarians of our own country who have given it a fair trial give good reports concerning it. I have tried it in a number of cases and found it satisfactory except in cases where the treatment had been greatly delayed. To those of you who have available a veterinary adviser I say by all means secure him as early as possible after you have noted the symptoms. His experience will enable him to give the treatment more quickly and more efficiently than you will be able to do. He is prepared for such emergencies, he has the proper drugs at hand and the instruments for administering them. In the event that a veterinarian is not to be had you should undertake the treatment yourself, and to aid you in remembereing how to do it I will demonstrate the method on the animal before us.

First, bed the cow with clean straw, stirring up as little dust as possible. Moisten the udder and wash the teats thoroughly with an antiseptic solution such as carbolic acid, a table spoonful to a quart of water, or better Creolin of the same strength. Dry the parts with a clean towel, then inject into each teat a solution of iodide of potash, 40 to 60 grains dissolved in a quart of water. You will find it convenient to have four one-quart Mason fruit jars thoroughly cleaned and scalded, then fill with hot water (soft water preferred) while the water is hot put into each jar the 40 to 60 grains of iodide of potash, place on the cover and permit the water to cool to the temperature of the body; this can be hastened by placing the jars in a vessel of cool water. The injection may be made by means of an ordinary household syringe, either the Davidson bulb syringe or the fountain syringe. (I have also used with success a two ounce hard rubber syringe, but the disadvantage of the latter is that it requires to be filled a number of times during the operation, and greater care is necessary to prevent contamination.) The syringe should be sterilized before using, by passing some of the carbolic or creolin solution through it, and washing the stem in the same solution. To the stem of the syringe a milk tube is attached by means of a piece of soft rubber tubing three or four inches long and about the thickness of an ordinary lead pencil. The milk tube is tied firmly into one end (the opposite end of the tube usually fits snugly enough on the stem of the syringe to not require tying.) The milk tube with the attached piece of rubber should of course be sterilized in the antiseptic solution before using. Care should taken during the injection to prevent the solution in the jars from becoming contaminated. If the fountain syringe is used, pour the fluid into it outside of the barn away from the dust. The dust from the hay and bedding contains bacteria which if introduced into the udder may cause a serious inflammation of that organ after the recovery of the animal from milk-fever.

If the Davidson bulb syringe is used, the suction tube must be introduced into the mouth of the jar containing the solution of potassium iodide. It will therefore be necessary to prevent contamination of the solution by folding a clean towel about the jar and over the top. After emptying the udder of milk, the milk-tube is passed carefully into the teat and the solution forced into the udder; the tube is then withdrawn, and the remaining quarters treated in the same manner. It is important to thoroughly knead the fluid into the udder, spend several minutes on each quarter, and repeat the kneading every hour. If in five or six hours marked improvement is not apparent give another injection of the solution of iodide of potash, give a third injection if necessary.

As an accessory treatment it is my practice if called to a case before the animal has become unconscious to give by the mouth a dose of Epsom Salts, one pound dissolved in a quart of warm water, adding to this a teaspoonful or more of ground ginger, and an ounce or two of whiskey or nitrous ether. If the animal is unconscious do not give medicine by the mouth, the fluids are apt to pass into the trachea and cause death from strangulation or give rise to a fatal broncho-pneumonia. It is also well to give an enema to remove feces from the posterior bowel. Maintain the animal in a comfortable position by means of props; sacks of grain and straw serve the purpose best.

HOW I MAKE CHEESE FOR THE MISSOURI MARKET.

(F. Whaley, Appleton City, Mo.)

This is not altogether a true expression as we find our best markets in Oklahoma and Texas which handle the bulk of our product. We find after coming here that our crowd is made up largely of butter men and farm dairymen, to which our paper will be, in some degree uninteresting.

The first thing we want in the making of a first class article ready to consume in thirty or forty days is wide awake patrons, alive to the interests all along the line. Here some make a great mistake in thinking that just so the milk will pass the man at the receiving door it will be the same to them. Our trade is built up and maintained by the quality of our goods whether it be cheese or butter, hence, the absolute necessity of the milk being delivered at the factory in the best possible condition.

Is it not true in every line of business, that the man who makes that business a success is the man that takes good care and looks after details? We do not make a perishable cheese ready to market in fifteen days because the market demands it so much, but because the patron demands his money.

How we do it: We use what is known as the Chedder system as much as practicable. This system takes its name from the village Chedder in Somerset, England.

To insure uniformity of our product it is essential that the milk be ripened to about the same degree each day. This may be ascertained by the use of the rennet test. The quantity of rennet used and the temperature at time of setting the vat are two factors which should be varied as the richness or acidity of the milk varies. In the spring when the percentage of fat is lowest a lower setting temperature and a large amount of rennet is used. As the season advances the temperature should be raised and the unit of rennet lessened, in order to make cheese firm in body. Now cut your vat as soon as it gets firm enough or will separate over one's finger cleanly. This cutting will expel the whey; unless cut into cubes of uniform size some will dry out sooner than others and thus make a mottled cheese. Handle your curd at this stage very carefully for rough treatment now will cause a loss of fat also a loss of quality. If the curd is from over ripe milk it will help some to cut finer than in ordinary use. This assists the whey to escape from the cubes, making them firmer, thus checking the development of acidity. After the cubes begin to toughen and contract in size, apply heat to further expel the whey. The temperature to be used for heating depends principally upon the richness of the milk. Under the same conditions the curd from rich milk will retain more moisture than a curd from poor milk. So when you have very rich milk a higher temperature must be used or soft pasty cheese will result.

If after cooking up to 98 degrees you find that your vat is developing acid too fast and curd is not contracting, or in other words the acid is ahead of the cook, draw off a greater part of the whey and add water, good clean water, at a temperature of a hundred, and this will check the acid, or if curd develops a gassy taint we find the same plan to be helpful. By this means a good cook is assured, and this is very important in the production of a good article. As soon as curd will fall apart when squeezed in your hand and a slight acid will show on iron, we draw off the whey and cut and pile in blocks of about eight inches square. These should be turned a few times to let them drain and from ¼ to ½ inch acid show on hot iron. In summer it will be necessary to run more acid to stand the hot days. Mill the curd that has been piled and turned for the required time or until it has become flaky and velvety, and we are now ready for the salt.

If curd is too moist use a little more salt, if dry not so much, as it does not require so much in solution. But at any rate don't salt your curd until it is soft and velvety, because here you enhance the flavor and texture of your product. Hoop your salted curd as warm as possible and apply light pressure at first so as not to destroy fat. Turn your cloths as soon as cheese gets into shape and make your finishing look clean and smooth.

FUTURE OF THE DAIRY INDUSTRY IN MISSOURI.

(By Geo. B. Ellis.)

Mr. President.—For the dairyman who has had many years of successful experience to get up before an audience and tell what he has done and how he did it is an easy task; for the scientist who has worked out some scientific principle, to prove it to others is not a difficult thing to do; but to lift the veil that covers the dark future and tell what may be expected to come to pass is entirely a different and a more difficult proposition.

It has been said that we can judge the future only by the past. Now I think the past a poor standard for judging the future. This we know by the past itself. The industrial progress of the first half of the 19th century would have been a poor standard by which to measure the last half of the same century. And yet notwithstanding this we can draw some reasonable conclusions of the future by what we have learned in the past. This we know; the people of the world must be fed; and the people who are engaged in producing the staple food products are sure of a permanent business. The food products of the world may be divided into four classes: animal, cereal, vegetable and fruit. These are all essential to the welfare of the human race, and the man who is engaged in producing any or all of these products need not be afraid of not having a permanent business, but he must study the conditions both present and future to know which may be the most profitable.

I want to make this broad statement: The nations of the earth which have achieved greatest success and all the nations which are achieving any great degree of success are countries where the live stock interests have been developed to a high degree. If this be true, and I fear no contradiction on this statement, if Missouri would become a great commonwealth, if the people of Missouri would become foremost among the people of this great nation, they must strive to develop the live stock industry of the State to the highest possible limit. Can we do it?

The most perfect environment that goes to produce fine quality in live stock is found in Missouri. The money the northern farmer must spend for fuel or cost of barns we have to buy bran or oil meal; the money the southern farmer spends for commercial fertilizers or extra feed when his grass is brown under the burning sun, we can spend for cottonseed meal. We can produce corn and wheat more cheaply than the southern farmer, and cowpeas and clover and bluegrass more cheaply than the northern farmer. No country on the face of the globe can produce, so abundantly, a greater variety of grains and grasses, and produce them more cheaply than the farmers of Missouri. All we need then to succeed, and to succeed well, is to concentrate our efforts in the right direction.

But what has all this to do with the future of the dairy industry in Missouri? Why, good feed and good cattle are the foundation of the live stock industry, and the dairy industry is a very important part of the live stock industry. What we want in Missouri is the highest possible developement of the live stock industry and to have that we must develop all its branches including the dairy industry. There should be no war between the farmer who is producing beef and the one who is in the dairy business; there is room for both, and the man must be governed by circumstances when he chooses between the two.

What are some of the conditions in Missouri that should determine which of these branches of the live stock industry a man should take up? The average size farm according to the last census report was a little less than one hundred and twenty acres. There are 154,952 farmers in this State each of whose farms contains less than 100 acres of land. The question arises how can the farmer manage to make the most out of one hundred and twenty acres of good land, the average size farm?

Let us see what he can do in the dairy business. Set aside fifty acres for pasture which, if properly taken care of, should keep twenty-five cows in summer; set off ten acres for vegetables, fruits and buildings and you have left sixty acres for cultivation; this may be divided into three fields of twenty acres each and a crop rotation adapted to suit the soil and local conditions. A rotation that might be profitably carried out in many parts of this State would be corn, wheat, clover. The corn cut and put in silo, the land sowed in wheat without rebreaking, and wheat sowed in clover. The money obtained for the wheat and clover seed crops should be put into other feeds and the benefits returned to the land in the manure. Where clover does not do well then the rotation might be as follows: Corn, wheat and cowpeas. Corn put in silo same as before; wheat sowed after corn, then after the wheat has been harvested put the land in cowpeas getting a good crop of hay the same year. Then without plowing put the land in wheat or rye for pasture, pasture until middle of May then plow the wheat down and sow cowpeas again. This rotation will give in three years one crop of corn, one of wheat, two of cowpeas, and green pasture from wheat or rye in the spring. This plan if carried out and all the manure from the barns saved and returned to the land, will give you a more fertile farm fifty years from now than you have today. But you ask what may be expected in return for this kind of farming?

From reports received from 40 butter dairies in Missouri the average production for each cow kept was 252 pounds of butter, this at 20 cents per pound equals $50.40 per cow; the skim milk fed to pigs and the calf sold for veal should add at least ten dollars more, making the gross production from each cow in the dairy $60, or $1,500 for a herd of twenty-five cows kept on 120 acres of land. In addition to this you have your ten acres for poultry, fruit and vegetables and the profit of the hogs that should be kept on the dairy farm. In the face of these facts I ask, what do you think of the future of the dairy industry in Missouri?

According to the 12th census the average annual per capita consumption of butter in the United States is a little more than 19 pounds. This means a total consumption in Missouri of about 59,000,000 pounds. The census figures also give the annual per capita consumption of cheese 3.3 pounds, or a total consumption for this State of about 10,000,000 pounds. In addition to this there is a large demand in all towns and cities for new milk, sour milk and cream. The commission men will tell you that this demand is not now all supplied from Missouri farms, but a great deal of it is shipped in from other states. Another important thing in favor of the future markets for dairy products is that the urban population of this State is increasing much faster than the population in the country. From 1890 to 1900 the total population of Missouri increased 16 per cent and during the same time the urban population, including only cities of 4,000 inhabitants or more, increased 33.6 per cent. Therefore there is little danger of overcoming the demand in our own markets for first class dairy products, at any time in the near future, and no one need hesitate on this account to embark in the business.

One objection sometimes offered to the dairy business is that it takes too much time and too close attention. I would ask what business is it that does not take close attention if you expect to succeed? The merchant, manufacturer, the railroad man or the man of any other profession must give the closest possible attention to his work. The merchant who gets a week off during the year is very fortunate, and if he is not well established in business, if he is just building up a trade he stays with his work every business day in the year. After his business is well established and he has a son or trusted employe with whom he can trust the management of the business then he can take a vacation without detriment to his trade. It is the same with the dairyman. The man who expects to succeed must give his work his whole attention every day in the year, at least until his business is so well established and until he has some one associated with him or an employe with whom he can trust the work.

One great advantage the dairy industry offers is that its returns are quick and constant. You go into the business today and your returns begin to come in tomorrow and are constant every day in the year. It seems very clear to me with all our natural advantages of soil, climate, wide range of cheap feeds and pastures, and a good market in our own territory, not yet supplied, the future of the dairy industry in Missouri is as promising as any other branch of farming.

The full development of the dairy industry in Missouri means millions of dollars added to the taxable wealth of the State, it means thousands of well improved farms with the comforts of life abundant, it means a better system of public roads in the State, it means more money for the education of the sons and daughters of the farm, it means that father and mother will have something put away for their support in declining years, it means that by this system of farming we can maintain the fertility of our lands and leave the farms of Missouri a rich heritage for future generations.

THE DAIRY INDUSTRY OF MISSOURI AS SEEN BY A COMMISSION MERCHANT.

(By Wm. N. Tivy, St. Louis.)

It was probably the intention of the committee when they placed me on the program that I should uncover some defects in your present system, as we dealers think they exist, so that you may discuss and correct if found desirable.

Lack of supply through the fall and winter months is the first and probably the most important point I have to offer. You may not think so, but it is a serious drawback to Missouri butter, which, like the Irishman's flea, is not there when you want it; while Elgin can always fill the bill. Again, when you don't want it "very much" in the dullness of summer, it shows up in full force, and some of it insists on being sold quick, or it will soon put on strength enough to overcome you.

Now that "Oleo" is properly restricted from taking your trade, more butter will be needed and you are called on to supply it with only the same ability, the supply will be short, at least for awhile.

If all the butter made through the country at present was first class, it would no doubt supply the demand, but it is not.

Now we come to another point, why can't we make butter always alike and equal to Elgin? With cows, grass and water as good as they have, it can be done if we will learn the cause of our failure. It may be the feed, or water, or bad surroundings, tainted cans, or some other cause before reaching the creamery.

A dealer may find poor butter, off flavor, yet be unable to give the exact cause, which is no easy matter, as there are so many causes.

Take the present exhibit here, and your judge though an expert will find it hard to state the cause of each defect, but if he is informed regarding all previous conditions and handling, he will be very apt to point it out.

Few of us realize how readily milk, cream and butter become affected by unseen particles, which often furnish starters of the worst kind; a little impure water or a little dirt can, in due time, play the mischief to flavor, consequently creamery men should be scrupulously clean around their factories and see that every vessel used by them and their patrons is perfectly clean also.

There are other things requisite as well as flavor, though it is the chief "body" as now used on your card, and is important, especially in summer. In cold weather, some extra working, which of course softens the "body" will not hurt as it enables the grocer to cut it out better. Mottles we find a continual drawback and many customers believe the white spots to be lard, but they are unsalted butter. More working will cause them to disappear. Natural June color is about the right shade.

Missouri tubs are not equal to the Elgin tubs; some of the former are quite poor and rough looking and so open that when butter stands in them over night, the brine leaks out on the floor and the tubs lose in weight. The covers are ill-fitting and the tins not properly placed. They should reach down and tack into the hoop.

I should have mentioned that solid packing is important, if butter has cooled off too much before putting into the tub, unless pressed down well, it leaves spaces that breed mould, if there is any around the tub.

Tubs should be filled level. It is necessary that paper lining should be used, and it ought to lap about one inch over the butter, a cloth covering on the butter and a paper one over it, which helps to retain the moisture and excludes the air. A paper covering next to the butter causes it to wrinkle up and look bad.

The keeping quality of butter is a most important point, yet one much over-looked by the butter maker, but without it the dealer can not hold his trade, because when a tub of butter turns strong in a short time or before being used up, it is next to impossible to sell the party who purchased it, another tub of the same brand, even though it seems good and you offer it to him at a reduced price.

That exclusively winter product, bitter butter, is just as bad as the summer product, rancid butter, and is its opposite in most all particulars, the low temperature starting the bitter ferment, which only proper heat and souring will counteract. This I ascertained after considerable investigation and expense many years ago and have published my results at various times in the Rural World.

BITTER MILK.

(By C. H. Eckles, Professor of Dairy Husbandry, Columbia, Mo.)

I have been asked to discuss bitter butter, its causes and prevention. The statements which I shall make are based mostly upon experiments which I have conducted along this line and are not a matter of theory. I cannot take time to refer to the sources of my information or to discuss any experiments in detail.

Bitter butter, as the butter men and consumers know it, is generally found in the winter season and mostly in the products of dairies rather than of creameries. Bitter taste may be found in any dairy product as well as in butter and is often found in milk, cream and cheese. The cause is the same, however, and what is said of it applies to the conditions wherever found.

Butter may be of good quality when made but develop a very bitter taste later. Milk may be perfectly normal when milked but become extremely bitter with age. This bitter condition has been credited by most dairymen to stripper cows or faulty feeding. The dairyman has been ever ready to blame the cow or the feed for every defect in butter or cheese, while as a matter of fact the cow, as a rule, gives a pure product and our common feeds seldom affect the quality of butter or cheese seriously. Nine times out of ten a poor product is not to be blamed to the cow but to the man.

Milk from stripper cows very rarely will have a peculiar, somewhat bitter taste but hardly sufficient to show in the butter under any circumstances. It is safe to say not one case in a hundred is due to this cause. If feed is used with very bitter taste it may go into the milk in sufficient amounts to cause the same bitter taste, but our common feeds are not bitter, and in fact it is as well to leave this cause out of consideration altogether as it is of so little importance.

The common bitter taste is due to an abnormal fermentation. It is generally understood now by dairymen that the souring of milk or cream is due to a formation of acid made from parts of the milk by the action of little yeast-like bodies called bacteria. The bitter taste is produced by bacteria also, but by another kind than the ones which sour milk. To produce the desired flavor in butter we want the cream to sour with a clean, sour taste, and in fact want to keep everything else in the way of bacteria out as much as possible. To get the cream to sour as much as we wish, we want to furnish the bacteria which do this and keep out the bad bacteria as the bitter producing kinds. We also want to handle our cream to prevent as far as possible those that may get in from doing any harm.

The bacteria which produce the bitter products, we find, are generally in hay dust and stable dirt, and some always find their way into milk, especially when the cows are in the barn. This is one of the two reasons why the bitter taste is more apt to be found in winter-made butter than in summer. The second reason, and the one having the most influence, is that cream in winter, in a small dairy especially, is often kept for a long time between churnings and at a rather low temperature. These bitter products will seldom if ever be developed in cream or milk kept at a temperature of 70 degrees or 75 degrees, as it will then sour but not become bitter, although it may become rancid if kept too long at that temperature. These bitter producing bacteria cannot work in the presence of any amount of acid or sourness. As soon as the souring begins the bitter product is not made any more. Butter does not generally become bitter for this reason, and the rapid souring of cream in summer is largely what prevents it getting bitter at that season. The bacteria which produce the bitter taste work best at a temperature so low the milk will sour very slowly.

The butter maker has the means of prevention always at hand. The first thing to do is to use a good sour-starter in the cream at once after separation, to start souring and check the other fermentations. Every butter maker who expects to make a high grade of uniform butter should make constant use of a good starter. The other point is to keep the temperature up until souring begins, and then cool, if necessary, to hold a day or two. Sour first and the bitter bacteria will not work, even if the cream be then kept cool a couple of days. Keeping cream over at a temperature of fifty to sixty degrees and later warming for souring is the condition that allows development of the bitter defect.

THE LITERATURE OF DAIRYING.

(H. A. Bereman, St. Louis.)

Since the days of Cadmus, the Phœnicians or whoever it was that invented books, the literature of the world has been the most potent factor for enlightenment.

From the old days when the white haired patriarch of a nomadic race, told to a circle of gaping youngsters, gathered among the brown tents tales of daring, wars, conquests, visions, history and prophecies of the tribe—to the knotted cords wherein was woven the history of Peruvian sun worshipers—to the birch bark picture writing of North American tribes—to the shards, engraved bricks, carved and painted hieroglyphics of old Egypt—to the wax tablet and stylus of ancient Rome—to the papyrus of the Nile—to the invention of paper—to Guttenberg's contribution of movable types—to the time of Ben Franklin and the old Washington hand press—to the present pinnacle of advancement, the Hoe web press turning out 30,000 perfect copies an hour, of a 16-page metropolitan daily, each copy a complete epitome of the world's history for one day at a cost of one penny and left by the R. F. D. at your door—literature has been the banner in the van of the steady march of progress from prehistoric times down to what we are pleased to call our Modern Civilization.

What literature, and by this I mean all recorded knowledge, has done for the world in general, dairy literature has done, in kind if not degree, for the dairy fraternity. I do not mean to say that the text books on special subjects, the periodical publications, the official bulletins, reports and statistical records which constitute the bulk of the literature of dairying, are the whole thing. Indeed it might be difficult to convince the class of husbandmen who "don't believe in book farmin'," that books and newspapers have any value whatever. But the dairyman who has achieved success by getting out of the rut of conservatism and traveling upon the hard high road of up-to-dateness, knows that only out of the vast storehouse of all men's contributions to this science—has come the knowledge which is power. It requires a tremendous assurance for one man to assume that his knowledge is all indigenous and that "nobody can't learn him nothin.' " The science of dairying is like a vast edifice, yet unfinished, to which each worker in his chosen field has brought one stone of original thought, and the literature of dairying is the cement which binds these stones together in strength and symmetry.

When a dairyman admits that he can't learn anything about his business by a discriminating reading of books and periodicals he is in a bad way. The difficulty with his case is that he won't take his medicine; he's not receptive; he needs an arrest of thought. Let us hope there are only a few of the species left and that they will wake up to the value of mental growth. All we ask of the intensely practical dairy farmer, is a realization of the fact that the world is progressing, and that the man who is unwilling to admit it is going to get left in the race.

It is true that "of the making of books there is no end," and many authors simply befog their readers with stuff which at best is visionary, impracticable or prejudiced. I think this is less true today than ever before. Scientific writers are more careful of their statements and less theoretical glittering generalities and more facts proven by experience and reason appear in the agricultural writings of today. After all the same test must be applied that is used to judge a man who is looking for financial credit. Discrimination in reading is a rare and valuable gift. Many credulous persons swallow everything they see in print as though there were something sacred about type-set matter. It's the man behind the pen you want to look for and the first questions to ask are "Who is the writer?" What has he done to justify a perusal of his offering?" It does not follow that everything by a well known or classical author is to be accepted as the law and the gospel.

It is said that the copy readers for the great magazines accept or reject an article by its opening chapter. In a measure this habit of the judicial mind may be used to estimate a scientific article on breeding, selecting of dairy cattle, sanitary methods of handling milk and any other topic wherein the writer claims an audience. It after all is a matter of faith unless you are reading on a subject with which you are better acquainted than the author. Fortunate is he who has a reason for the faith that is in him. Just as unfortunate is the skeptical habit of mind which locks the treasure house of knowledge against the searcher for truth.

By an increasing knowledge of human nature one is enabled to know by a man's voice and manner when he is telling the truth. In the same way, by reading between the lines, the reader may by practice winnow the grain from the chaff or, I might better say, separate the cream from the skim milk. Lord Bacon, I believe, expressed this thought thus: "Read—not to believe and take for granted, nor to confute and contradict; nor to find talk and discourse, but to weigh and consider."

I have dwelt upon this idea of discrimination in reading dairy literature, for I believe it to be the key, the open sesame, to intellectual growth as well as in the mere learning how better to feed, or churn, or market one's produce.

There are certain classics which are almost indispensable to the library of the progressive dairyman, at least I have found them to be indispensable in my own experience. Henry's "Feeds & Feeding," Woll's book on "Silage," Peer's "Soiling," Coburn's "Alfalfa," Monrad's "A. B. C. in Cheese Making," and "Pasteurization," and Gurler's "American Dairying," are a few of these. There are others equally as good and some also, I regret to say, which belong to the realm of trash.

It is impossible to speak of official reports and bulletins without referring to the great good being accomplished by the national and state departments of agriculture. I wonder if the dairymen of this state and the members of this association fully realize what a mine of wealth lies at their very doors, or at least can be brought to them merely by request in the published bulletins of the Dairy Division, Bureau of Animal Industry of the National Department of Agriculture.

Just a year ago at Palmyra, we had the pleasure of listening to an informal talk, by R. A. Pearson, late Assistant Chief of Dairy Division at Washington, on dairy conditions in our new possessions, Porto Rico, and adjacent islands. Since then Mr. Pearson has embodied in a volume of a hundred pages, a complete report of his investigations, accompfanied by numerous photographic illustrations of dairy types, which are chiefly valuable as horrible examples of how not to do it. Of a more practical nature are numerous pamphlets by Mr. Pearson and Major Alvord, the chief of the dairy division and others, on "Market Milk," "Care of Milk on the Farm," "Facts About Milk," "The Dairy Herd," "Milk as Food," "The Conformation of Beef and Dairy Cattle," "Household Test for Detection of Oleomargarine and Renovated Butter," "Breeds of Dairy Cattle," and others. The State Bulletins, issued by the various experiment stations are just as useful, and a list of these would be as long as the moral law.

Prof. Eckles sent out one last spring on "Raising Calves with Skim Milk," which every dairy farmer ought to read, and the Pennsylvania station has recently published a bulletin telling how to raise calves on no milk at all. If some one doesn't tell some of these days how to raise calves without feed, it will be only because the latest data was furnished by that too thrifty farmer who managed to keep his cow on a straw a day but before he could quite prove his theory, the cow died.

One of F. D. Coburn's comprehensive quarterly reports took up the general subject of "Dairying in Kansas," most of which could be read with profit by Missourians.

Iowa, Minnesota, Wisconsin, Illinois, New York and other dairy states have devoted much attention to the promulgation of dairy literature, and one of Wisconsin's latest is a book every cow boy should possess—yes, and every cow boy's boss. It is called "Investigations on Methods of Milking." It lies on my desk still unread, but I am going to tackle it when I get back home. The pictures in it are well worth the price of admission.

All the government bulletins are free for the asking, and state bulletins are sent on the same easy terms to residents. I believe a small fee covering postage and actual cost of printing will fetch those of other states. I may say in passing that for the dairyman who is also a general farmer, there are scores of bulletins on topics which touch dairying on the edges. Send to the Secretary of Agriculture, at Washington, for a list of Farmers Bulletins, then pick out what you want, or you can say, like the Texas cow boy of the bill of fare in a fashionable eastern hotel, "just gim me from here down to here," and corrall the whole bunch.

I come now to the most important branch of dairy literature: The Agricultural Press. You will not hold me unduly responsible for this definition, when I hasten to add that its importance is due to the form, rather than to inherent qualities.

Modern advertising makes it possible to furnish for a cent or two a copy, a weekly dairy paper of from 8 to 32 pages, containing news items, reviews of bulletins, special articles written by experts, reports of dairy meetings, reports of creamery patron investigations, correspondence by practical dairymen either asking information or giving their experience, market reports with articles on market conditions, questions and answers on veterinary matters, etc., etc.

The cheapness, the periodicity, the method of grasping at salient facts of real moment and presenting them in condensed readable form, the winnowing out of chaff and preservation of the good wheat, the peculiarly complex nature of the modern newspaper as censor, pulpit and forum—all these stand for the reasons why the dairy press, representing the few strictly class papers and the "Dairy Department" of general farm publications, constitutes the most important branch of the literature of dairying.

I will consider briefly the relations of the Dairy Paper to the Department of Agriculture, to the Agricultural colleges and to the Dairyman.

The National Department of Agriculture is doing a wonderful work; and the notable feature of this work is that, as our very efficient Secretary of Agriculture, Mr. James Wilson, says, "Agriculture is in its infancy." There is so very much more to come than what is passed in the history of the science of Agriculture, that we can not measure in mere dollars, nor indeed by any gauge, the results of the Department's labors. I find myself speaking and thinking of the broad field of the Department's work and of the whole realm of farm papers, but what is true of them is true in a measure of the special efforts of the Division of Dairy Husbandry on the one hand and the disseminating agency of the strictly dairy publications and dairy departments on the other.

You begin to see, doubtless, the point I wish to make. That is, notwithstanding the five millions appropriated by the Government for the Department of Agriculture and in spite of the volumes of printed matter sent out by that department, these treasures would in most cases be lost in the mines of wealth, buried in the darksome caverns of official and statistical reports, did not the busy editor pick and shovel with the pen and—scissors, and dig out the nuggets, polish them and present them in get-at-able shape, through the columns of the weekly visitor. The press is forever searching for new thoughts. It is a digestor and distributor. The influence of the pebble of wisdom dropped in the ocean of truth, is carried to the utmost confines of earth by the widening, ever widening waves of the public press.

The same process of selection and dissemination is seen with reference to the work of the Agricultural colleges and the various experiment stations. The Agricultural press thus aids in that University Extension work, which has lately received the attention of our best educators. If Mahomet can't go to the mountain, we must carry the mountain to Mahomet. There is a growing appreciation of the value of self education and the prevalence of so-called "correspondence schools" illustrates the tendency. We can not do without the colleges—the centers of learning where in laboratory and field, and by the midnight oil are worked out the problems of life, but no university should be satisfied with the little family of foundlings for whom she stands as foster mother, when by spreading her wings she can brood under her motherly breast the whole race. The white wings of Alma Mater are the fluttering speeding pages of the press, flying from one end of this great continent to the other, extending the good work, helping those who may, to go to the founts of learning and drink direct full draughts from the Pierian spring, and for those who may not, conveying thence the cup for their refreshment and inspiration. What a vast irrigating system it is.

The coincidence of our meeting, not only in the college town of the great commonwealth of Missouri, but in this beautiful and appropriate building and under the quasi-protection of the University authorities, is my excuse for dwelling upon this phase of my subject, and I wish I could emphasize in a convincing way the close relations which should exist between the Agricultural college and the Agriculture newspaper, for the extension of the light of the central lamp of learning. This is the true correspondence school of agriculture. This is the logical development of the idea of university extension.

If you think I am soaring in the heights, I will get down to practical earth and give you an illustration of the influence of dairy literature upon an aspiring young dairy farmer, whom I happen to know personally, and how he learned, by reading, the common everyday things of his business.

This young man of fairly good common school education, was forced, through ill health, to relinquish a lucrative office position in the city of St. Louis, and he was persuaded to go on a dairy farm. His assets, when I first knew of his enterprise, consisted of two cows of the breed known as scrubs, an old horse that he bought for $17.00, a rickety phaeton for which somebody buncoed him out of $4.00 more, a monumental assurance and a rich endowment of ignorance on all subjects relating to the cow industry. He dropped into the office of the Rural World and asked for something to read on dairying. He could not have gone to a better man than Levi Chubbuck, who loaded the young aspirant for knowledge with tracts on various dairy matters and with these and the names or one or two dairy papers the young man marched home. What he didn't know about dairying would fill a volume and what he hoped to learn would fill a library. I think that is enough about the young man except two brief chapters in conclusion.

Chapter two is the general fact that the young man is prosperous; he has a fine herd of Jerseys which he selected on his own judgment aided mainly by his study of dairy type and the illustrations of ideal dairy cows in such papers as "Hoard's Dairyman," and the "Jersey Bulletin," he gets the highest price for his milk, because he has put into his business the transferred brains and ideas of every expert who has crystalized his experience into type.

Chapter third is simply the young dairyman's solemn assertion that barring the hard knocks he got in undoing things—and the dear old teacher, experience, gives us some severe jolts—he learned all he knows about dairy form, scientific breeding, butter making, balanced rations, protein, and the Grout bill, by reading. * * * * *

I observe that the oleomargarine question has no formal place on this program. Some husky member of this association should have been assigned the topic, "what shall we do with the oleo law, now that we have got it." It is not within my province, if I stick to my text, to discuss the merits of the present national color law. I am not allowed to say, that the oleogarchy will not submit, if strategy, audacity and millions of money will defeat the provisions of the law. I am off the track of my theme if I state, what you all believe, that our interest in this legislation does not cease on the signing of the bill by the President, that eternal vigilance is the price we must pay for the execution of this law, that I know of my personal knowledge, that in St. Louis little of the high colored oleo is being sold to-day, but that people are buying in Union Market every day the "uncolored goods," believing it to be butter, that this belief is based on a "slight shade of yellow," which the natural oleo has assumed in place of the old "greenery" "yellery" tint.

There is still one branch of the literature of dairying of which I wish to speak, and it bears directly on the subject of legislation. Whether the present law is to be effective or not remains for future history to disclose. I have my own opinion. I believe it is not the last which Congress will be called upon to pass, and when that bill comes up you have in your hands a power that for the specific purpose of influencing legislation is mightier than the ballot, and greater than the most clever and high handed lobby, and that is the postal card. This species of dairy literature, aimed at your representative, embodying in a few, brief, plain words your desire, has more weight than columns of phillippies by the press. It beats the initiative and referendum, and it will beat a paid lobby all to smash, if there are enough of you who will act.

Congressmen will truly represent their constituency on any measure, providing that constituency speak up in no uncertain terms and tell them what they want. If you think your representative in Congress of the Legislature is wavering, snow him under with postal cards.

I do not wish to unduly emphasize the importance of dairy literature. I wish to place it before you in its right relations to all the other factors in the world of dairying. The pride, ambition and enterprise of the individual members of the grand army of dairymen is the real force. The Babcocks of the profession are the men behind the guns. The guns of the campaign for better and more profitable methods are the dairy and agricultural papers; these are the gatlings and the maxims, I may say the weekly maxims; and the official bulletins on hundreds of topics bearing upon Dairy Science are the six pounders; the comparatively few text books of real value constitute the rifled cannon, the disappearing great guns of coast defense.

The literature of dairying is a medium of communication of individual ideas, and when a man says he cannot afford to take a farm paper and "don't believe in book farmin' because it ain't practical,"— Oh, that word "practical" what sins have been committed in thy name—he arraigns nothing but his own inability to learn from the experience of his fellow men, so the true status of dairy literature is not that it is the whole thing, but that it is the most powerful link in the chain, the most indispensable department in the battle of progress against archiac methods. The pioneers and the investigators in the science of dairying are the gunners, ideas are the ammunition, the press is the artillery, the enemy are the mossbacks of conservatism sitting on the tail of progress, and the battle flags of victory are even now fluttering in the breeze upon the outer walls of the citadel.

SELECTING DAIRY COWS.

(By F. B. Mumford, Professor of Agriculture, Columbia, Mo.)

In conducting the dairy business at a profit, the most important factor is the selection of the cows that will comprise the dairy herd. It matters not how skillful a dairyman may be in handling milk or butter or how good a feeder he may be, if the cows in his herd are inferior and low producers, he cannot hope to make a profit from the business.

It will not require any argument to convince the average man that there is a very great difference among animals in their ability to produce a given amount of product on the same food. One sheep for example, fed a certain weighed amount of food will produce six pounds of wool, whereas another animal fed in exactly the same way will produce thirty pounds. Some horses will consume a bushel of oats and do very well if they manage to trot a mile in four minutes, while other horses fed the same kind and quantity of oats will be able to trot in two minutes. This is not due to any difference in the methods of feeding or in the character of the food fed, but it is primarily due to a difference in the efficiency of the animal machine. There are some cows, when fed a certain amount of food, that will produce one hundred pounds of butter in a year; there are other cows, subject to exactly the same sort of treatment receiving exactly the same amount of feed that will easily produce two hundred pounds in one year. We must therefore attempt to secure cows that will produce a maximum yield with a minimum amount of feed.

We are to look upon the dairy cow as a machine and she is a machine that is able to consume the raw products of the farm in the shape of corn, oats, hay, pasture, etc., and make therefrom a valuable product, milk, and her value in the dairy herd will depend primarily upon the efficiency with which she is able to bring about this transformation of raw products. The question is, how are we able to select animals possessing this desired ability? Is it possible from the external form of an animal to predict in any certain degree the ability of that animal to produce milk and butter from the food consumed? In answer to this question, it may be said with considerable assurance that under certain conditions and within certain well known limits we can judge of the value of any animal for the production of milk and butter.

Before going any further, it may be well to consider briefly how we have come by this knowledge. In the beginning man selected animals valuable for his use, and by continuous selection developed breeds of animals that possess certain characteristics. For example, it was soon discovered that animals were able to produce a valuable product, meat, that was much sought after for food, other animals yielded milk, other animals wool or hair which might be used for clothing. As man developed in reasoning powers, he observed that those animals which were most valuable for beef had a certain form and those which were selected for a long time because of their efficiency as milk producers, had always present certain essential characteristics. Thus at the present time, standing as we do at the end of these efforts to improve the domestic animals, and being able to observe the results of careful selection through long periods, we are able to see that animals which produce any certain product in abundance have associated or correlated characters that are always present. Animals that are selected for speed have small trim legs and deep chests, generally with sloping haunches and are in most cases of relatively small size; on the other hand, those animals that have been selected for draft purposes are larger, coarser, with coarser bones and joints and often great vigor of constitution. In animals that have been selected because of their efficiency in producing milk and butter for a great many generations, we always find in the best animals a certain type or conformation.

GENERAL APPEARANCE OF THE DAIRY COW.

The general appearance of a typical dairy cow, giving milk in abundance, is angular, thin, somewhat loose-jointed and with prominent bones. In general it may be said that animals that remain in a fleshy condition while at the same time giving milk are in most cases not profitable dairy animals. Beef animals possess the ability of consuming the raw products of the farm and producing therefrom beef and depositing this between the muscular fibres and in the connective tissue of the body. Dairy animals, on the other hand, possess the ability of making fat from the feed, but this fat, instead of being stored or deposited between the muscular fibres, is deposited in the udder and ultimately appears in the milk as butter fat. Now any animal that possesses the ability to produce butter fat and deposit it in the udder in large quantities cannot at the same time deposit the same fat between the muscular fibres; therefore, fat looking cows are not, as a rule, to be selected for dairy purposes.

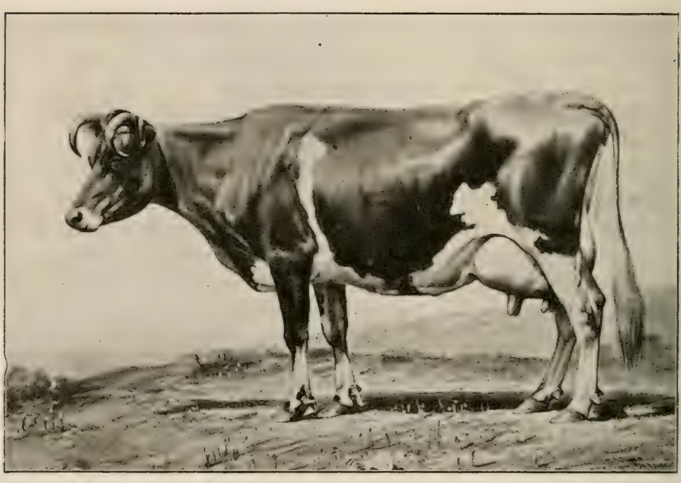

Fig. 1. Imp. Comassie 11874.
Test, 16 lbs. 11 oz. Butter in 7 Days. Champion Cow Island of Jersey for Five Years.
Ancestor of Many of the Most Noted Animals in the Jersey Breed.

FORM OR CONFORMATION.

Some animals possess in a remarkable degree the ability of consuming large quantities of feed and producing therefrom large quantities of milk and butter. Pauline Paul, a Holstein Fresian cow, produced 1,143 pounds of butter in 365 days. Signal's Lily Flag, a Jersey, produced 1,047 pounds of butter in one year. These cows all have a distinctive form and that form is best described perhaps by saying that the animals are wedge shaped. They are wedge shaped when viewed from the front; they are wedge shaped also when viewed from the side and they are wedge shaped when viewed from above. That is, the withers are sharp, and the distance through the heart is large, thus giving us the wedge shaped appearance in front. When viewed from the side, the large pelvic regions and udder are so much deeper than is the depth of the forequarters that we have also a wedge shaped appearance from the side. Then if we look down upon these animals we see that the hips are wide and that the lines drawn from the hips to the withers converge, thus giving us the third wedge shape when looked at from above. This form is always present in the best dairy animals. A mistake is sometimes made, however, particularly in viewing the wedge shape from the side; it must not be supposed that shallow forequarters are desirable, but the wedge shape should always be brought about by the increased depth of the hind quarters and abdominal development of the cow. This typical form is highly important. See Figs. 1 and 2 for a high development of the

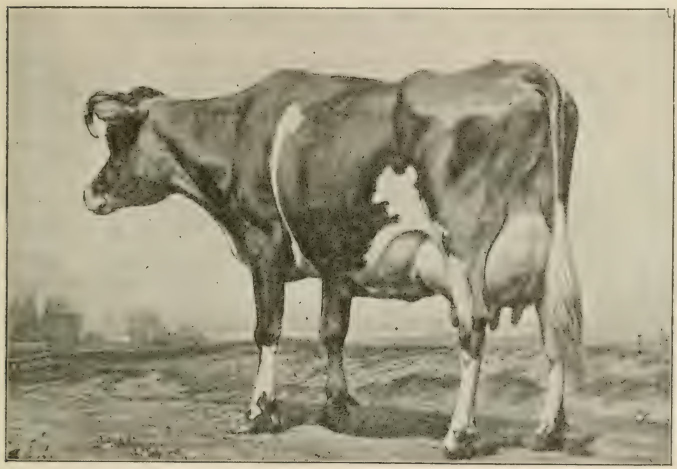

Fig. 2. Another View of Comassie, Showing a Wonderful Development of Dairy Form.

best dairy type. Fig. 3 illustrates an animal lacking greatly in capacity and deficient in dairy form. This cow was not a profitable producer.

THE HEAD.

The head should be lean, moderately long, with face slightly dished and a generally contented expression of the features. The muzzle should be large, the mouth large, the nostrils wide and open. A clear, full, bright eye is indicative of good health and good nervous power. A broad, full and high forehead is undoubtedly an important characteristic and is important because it indicates a large brain, which, as the center of the nervous system, determines in no small degree the efficiency of the milking functions. Numerous observations have led us to believe that the milking function is very closely related to the nervous system of the animal and anything that disturbs the nerve activities of the animal disturbs the function of milk giving. It is therefore highly important that the nerve power of the animal should be fully developed. The ears are best when of medium size, fine texture, covered with fine hair and of an orange yellow color inside. The orange yellow color is usually associated with healthy oily secretions observed on other parts of the skin and are said by some to indicate the ability of the animal to produce rich milk. Whether that may be true or not it is certain that breeds like the Jersey and Guernsey that habitually produce rich milk have this yellow color developed to a higher degree than other breeds that do not give as rich milk. The neck, unlike the beef animal, should be thin, moderately long, with little or no dew lap and the throat clean. Wide spaces between the jaws is a good indication.

THE FOREQUARTERS.

The withers should be lean and sharp and the shoulders lean and oblique, the chest deep and wide. A wide, deep chest is undoubtedly evidence of vigor and constitution. In the selection of the wedge shape, the writer believes that this characteristic has been altogether too much neglected and its importance underestimated. It must always be remembered that constitutional vigor is important in any of our domestic animals and particularly so in our dairy cows that produce large quantities of milk and butter. The forelegs should be straight, short and fine boned.

BODY.

A large heart girth is believed to be a valuable characteristic because it indicates, among other things, a fairly well sprung rib and large development of the chest with the consequent increased development of lung power. The ribs should be well sprung and long, and each individual rib broad and the ribs themselves far apart. A well sprung rib is necessary in order that the animal may have sufficient capacity for storing and digesting the immense quantities of feed necessary to produce the milk and butter. The back should be high and lean. The spaces between the vertebrae, called by some the chine, should be far apart; the spaces wide and open. The loins should be broad and strong, held well up to the level of the back.

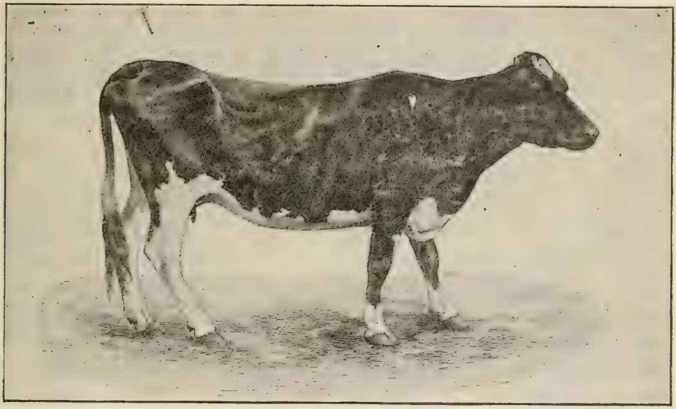

Fig. 3. Bettie, a Guernsey Cow Owned by the Minnesota Experiment Station. A Year's Test Showed Her to be an Unprofitable Animal.

THE HINDQUARTERS.

The abdomen should be very large and deep, showing great capacity. What is known as capacity in dairy animals is indicated by a large abdomen showing large room for the digestive organs. Figs. 1 and 2 show an animal having great capacity. Fig. 3 illustrates one very deficient in this important quality.

However important may be the characteristics already mentioned the efficiency of the animal will after all be most determined by the qualities observed in the hindquarters. It is here that the milk is elaborated and evidences of milk producing efficiency are to be found. The hips should be wide apart and level with the back, the rump long, high and wide and many authorities favor an arching pelvis. The pin bones or thurls should be high and wide apart. In many of the best dairy cows, we find the pin bones so high that the line from hips to the setting on of the tail rises somewhat toward the tail. This is undoubtedly a good characteristic. The thighs should be thin, in-curving but well muscled. It may again be said on this point that all the characteristics here mentioned are of secondary importance when compared with the development of the udder and milking veins of the producing cow. The udder should be large, extending well forward, full but not fleshy, the quarters even. The attachment to the body should be as large as possible, extending well forward and extending up behind. The udder should milk out thoroughly so that when it is empty it will be considerably smaller and very flexible. The milk veins, which may be observed just in front of the udder, should be large, elastic, as crooked as possible and branching. The main milk vein enters the chest through an opening known as the milk well and this milk well should be large. The milk well seldom changes much in size. The milk vein is very much larger while the animal is in full milk than when the animal is dry; therefore the milk well may sometimes be regarded as a surer index in a dry cow than the milk veins themselves.

We have attempted in the above to give a somewhat detailed account of the characteristics that are found in the best dairy cows and that are considered important in selecting the highest producing animals. The relative importance to be placed upon each of the points indicated is subject to some difference of opinion, but in general we are all agreed that certain of these characteristics are much more important than others and we have attempted to indicate by the score card published below the relative value to be placed upon these regions and points of the cow:

POINTS OBSERVED IN JUDGING DAIRY CATTLE.

Fig. 4.

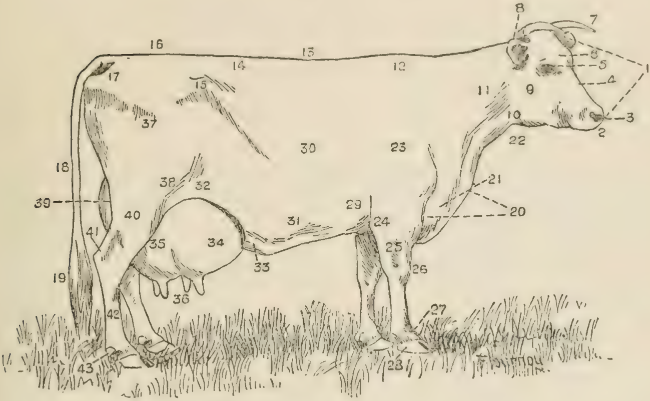
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Diagram of cow showing points. (From Farmer's Bulletin 106, U. S. Department of Agriculture.)

1. Head.
2. Muzzle.
3. Nostril.
4. Face.
5. Eye.
6. Forehead.
7. Horn.
8. Ear.
9. Cheek.
10. Throat.
11. Neck.
12. Withers.
13. Back.
14. Loins.
15. Hip Bone.
16. Pelvic Arch.
17. Rump.
18. Tail.
19. Switch.
20. Chest.
21. Brisket.
22. Dewlap.
23. Shoulder.
24. Elbow.
25. Forearm.
26. Knee.
27. Ankle.
28. Hoof.
29. Heart girth.
30. Side or barrel.
31. Belly.
32. Flank.
33. Milk vein.
34. Fore Udder.
35. Hind Udder.
36. Teats.
37. Upper thigh.
38. Stifle.
39. Twist.
40. Leg or gaskin.
41. Hock.
42. Shank.
43. Dew claw.

Score Card B—Dairy Cattle.

Scale of points.	Perfect.
General Appearance:	
Form, wedge-shaped viewed from front, side and above	10
Quality, indicated by fine hair, soft skin of medium thickness, and fine, clean bone	5
Temperament, sanguine, nervous	5
Head:	20
Muzzle, clean cut; mouth large, nostrils wide and open	1
Face, lean, long, slightly dished; expression contented	1
Eyes, full, mild, bright and clear	1
Forehead, broad, full and high	1
Ears, medium size, yellow inside, fine texture	1
Forequarter:	5
Neck, thin, medium length, throat clean, dewlap small	3
Withers, lean, sharp	3
Shoulders, oblique, lean	2
Chest, deep and wide	3
Legs, straight, short, clean boned, cannon fine	1
Body:	12
Girth, large	4
Ribs, well sprung, long, broad, far apart	4
Back, high and lean	2
Vertebra, large, spaces wide and open	2
Loin, broad and strong	4
Abdomen, large and deep showing great capacity	8
Flank, deep, velvety and thin	2
Naval, large	1
Hindquarter:	27
Hips, wide apart, level with back	3
Rump, long, high and wide; pelvis arching	3
Pin Bones, high, wide apart	2
Thigh, thin, incurving, well muscled	4
Fore Udder, extending well forward, full, not fleshy, quarters even	6
Hind Udder, attached high behind, full, not fleshy, quarters even	6
Teats, uniform, good size, well placed	4
Milk Veins, large, elastic, tortuous, branching	3
Milk Wells, large	4
Legs, clean boned, wide apart, straight, cannon fine	1
	36
Total	100

MISSOURI LIVE STOCK.

An abstract of the assessment of horses, mules, asses and jennets, and neat cattle as shown by the assessors' returns June 1, 1902. (Compiled for this report by Hon. Albert O. Allen, State Auditor.)

Counties.	Horses.		Mules.		Asses & Jennets		Neat Cattle.	
	Number.	Valuation.	Number.	Valuation.	Number.	Valuation.	Number.	Valuation.
Total for State.	763,717	$20,159,764	222,329	$6,625,233	7,493	$365,284	2,251,104	$30,978,943
Adair	8,082	$183,650	938	$22,030	87	$2,870	24,058	$319,630
Andrew	5,932	165,285	1,565	69,490	76	5,530	31,738	476,990
Atchison	8,121	207,645	2,892	88,065	28	2,120	34,095	547,055
Audrain	8,181	228,360	3,166	101,470	159	5,560	21,454	361,010
Barry	7,745	192,956	2,218	58,576	72	3,015	19,723	209,078
Barton	8,260	174,852	1,816	45,994	86	3,597	21,253	244,548
Bates	13,048	314,330	2,828	87,284	132	6,496	34,734	432,714
Benton	6,706	154,275	1,998	58,044	106	3,415	21,516	347,340
Bollinger	4,305	128,285	1,784	56,475	34	2,605	13,381	130,542
Boone	7,266	196,310	3,441	117,970	153	7,500	18,804	291,565
Buchanan	9,165	249,370	2,388	76,390	73	3,825	18,848	307,695
Butler	2,730	70,825	982	29,469	16	630	10,298	81,414
Caldwell	7,102	174,485	1,155	31,331	33	2,090	26,660	406,538
Callaway	8,109	186,820	3,711	105,820	269	12,235	17,353	262,033
Camden	3,972	119,667	1,067	36,601	42	1,305	15,284	238,535
Cape Girardeau	6,083	161,195	2,539	78,765	78	3,980	13,814	130,498
Carroll	10,382	255,210	3,612	103,899	120	6,020	27,004	393,248
Carter	910	29,180	642	20,088	12	350	4,939	52,473
Cass	10,640	261,092	2,849	79,377	92	5,192	29,671	433,347
Cedar	6,873	203,339	1,413	41,312	57	4,005	17,238	267,388
Chariton	10,476	256,699	2,910	84,287	86	4,755	27,338	419,065
Christian	5,581	157,896	1,564	49,396	69	3,885	15,811	190,553
Clark	6,628	144,200	928	26,686	21	1,500	18,097	264,995
Clay	5,796	167,720	1,293	38,175	46	7,290	18,862	281,872
Clinton	6,306	170,370	2,062	58,366	69	3,065	26,363	429,111
Cole	3,356	85,010	1,094	30,530	15	640	9,429	109,980
Cooper	6,983	174,870	3,732	141,115	118	5,225	19,111	284,325
Crawford	2,873	81,520	1,454	46,370	42	1,075	11,523	158,166
Dade	6,031	148,061	1,668	50,273	84	3,925	16,701	205,940
Dallas	5,663	129,882	1,568	39,341	82	2,720	16,323	190,809
Daviess	11,589	255,418	2,343	65,177	105	5,945	34,833	500,815
DeKalb	7,398	175,825	1,169	32,439	66	2,722	30,899	443,589
Dent	3,395	98,162	1,521	40,312	59	2,565	13,852	143,422
Douglas	4,769	134,072	897	25,240	38	1,360	13,553	151,549
Dunklin	4,993	162,645	3,411	101,144	22	1,535	17,652	160,185
Franklin	5,546	150,447	2,743	79,390	30	1,325	13,537	194,648
Gasconade	2,996	89,078	1,970	59,986	32	1,342	10,408	116,640
Gentry	10,383	247,955	1,300	35,805	110	6,685	36,719	529,430
Greene	12,300	279,332	3,675	98,124	104	4,050	28,474	313,390
Grundy	7,074	168,423	1,152	30,968	93	3,425	28,509	417 159
Harrison	15,122	341,637	1,717	44,545	86	5,130	51,042	813,847
Henry	9,944	280,000	2,503	82,235	60	4,685	29,541	390,175
Hickory	4,760	135,124	1,191	30,510	49	2,735	16,531	230,114
Holt	7,304	170,990	1,967	54,200	33	2,570	18,509	271,755
Howard	6,147	150,255	3,081	97,765	97	5,960	17,815	281,565
Howell	4,631	122,124	1,439	42,420	64	2,306	13,036	138,956
Iron	1,478	40,772	744	22,676	13	1,020	5,650	63,391
Jackson	16,668	532,840	3,114	115,718	....	....	25,520	408,825
Jasper	17,081	458,386	1,903	62,397	64	3,625	23,779	382,910
Jefferson	5,093	123,575	2,246	61,670	61	1,905	16,181	171,935
Johnson	11,361	335,645	4,022	124,889	134	8,740	33,567	530,079
Knox	5,642	134,587	1,279	33,324	41	2,400	22,180	329,175
Laclede	5,503	144,694	1,494	43,945	120	3,471	15,217	209,014
Lafayette	11,126	340,315	4,303	145,953	106	7,740	28,778	470,165
Lawrence	8,839	228,775	2,752	80,491	83	3,780	17,089	222,343

MISSOURI LIVE STOCK—Continued.

Counties.	Horses.		Mules.		Asses & Jennets		Neat Cattle.	
	Number.	Valuation.	Number.	Valuation.	Number.	Valuation.	Number.	Valuation.
Lewis	6,350	$155,255	1,592	$41,255	41	$3,110	19,256	$281,352
Lincoln	6,973	171,530	1,090	33,825	11	850	17,356	252,755
Linn	9,217	195,108	1,313	34,477	37	1,677	33,512	430,850
Livingston	9,145	235,107	1.008	27,221	31	1,255	25,038	383,692
McDonald	4,343	111,852	1,220	34,653	46	1,505	13,397	149,197
Macon	12,505	329,185	2,833	77,505	218	9,525	33,403	520,315
Madison	2,215	62,935	1,102	30,980	34	1,870	9,118	102,775
Maries	5,231	119.923	2,789	78,204	26	995	13,037	143,748
Marion	6,223	156,590	1,017	31,020	42	2,210	12,311	185,395
Mercer	7,698	216,535	802	24,404	33	2,230	32,383	510,831
Miller	5,120	116,455	1,362	33,660	41	1,475	17,688	183,870
Mississippi	2,001	57.100	3,285	93,360	20	1,395	10,333	101,073
Moniteau	5,311	124,256	1,966	54,690	77	3,350	13,743	158,280
Monroe	8,033	207,280	2,847	80,520	150	9,460	21,515	312,360
Montgomery	4,819	143,995	1,737	50,184	55	1,920	16,592	243,470
Morgan	4,520	115,715	1,920	50,760	81	3,235	13,508	187,817
New Madrid	2,016	44,485	2,694	68,409	16	560	9,768	61,344
Newton	8,506	187,845	1,383	35,645	63	1,935	15,563	202,205
Nodaway	16,425	422,467	2,548	74,431	65	3,544	64.964	898,874
Oregon	3,422	69,211	1,312	32,392	23	485	12,803	118,861
Osage	3,183	79,225	2,562	78.560	30	1,445	13,329	169,334
Ozark	3,017	82,975	788	22,970	24	1,720	16,551	186,786
Pemiscot	2,467	71,072	2,957	100,538	28	1,665	12,797	130,876
Perry	4,357	109,966	2,423	67,948	34	1,480	10,633	102,921
Pettis	9,981	263,904	3,119	99,235	82	4,355	29,525	486,264
Phelps	3,474	80,888	1,145	32,014	71	1,747	13,030	169,122
Pike	7,448	227,740	1,617	53,091	261	11,990	16,769	278,910
Platte	5,384	144,840	3.095	87,095	55	3,940	13,018	214,370
Polk	8,111	238.060	2,029	61,128	110	5,915	20,724	305,018
Pulaski	3,387	78,425	896	20,895	53	1,110	12,921	146,725
Putnam	9,333	210.776	1,121	27,421	67	2,505	33,877	442,805
Ralls	4,054	119,645	1,071	33.075	72	3,500	13,699	198,460
Randolph	6,667	204,355	1,502	46.652	104	7,235	14,843	226,176
Ray	9,981	290,268	3,654	117,748	139	6,995	27,400	456,565
Reynolds	2,095	58,158	1,188	36,787	12	960	11,303	125,197
Ripley	3,074	86,261	1,303	38,030	27	1,315	11,281	119,053
Saline	10,414	297,765	4,844	174,464	110	5,990	32,617	507,940
Schuyler	6,615	174,493	1,002	27,431	45	2,330	19,919	296,361
Scotland	6,472	182,815	976	29,985	64	2,045	10,855	31,175
Scott	2,900	80,983	3,463	98,913	19	821	15,872	23,105
Shannon	2,148	65,520	880	25,999	26	770	10,372	116,417
Shelby	7,252	207,095	1,912	59,974	79	5,460	20,008	304,183
Stoddard	5,844	157.717	2,941	88,366	50	2,403	16,453	153,296
Stone	3,263	89,637	937	26,312	43	1,510	10,614	132,522
St. Charles	7,286	227,770	2,280	74,585	28	620	14,762	242,179
St. Clair	8,126	184,660	1,259	32,835	60	2,575	23,845	284,390
St. Francois	2,696	66,105	852	24,220	7	650	8,100	83,640
Ste. Genevieve	2,591	70,385	839	26,385	26	1,485	7,417	78,622
St. Louis	7,266	229,665	3,282	120,985	....	....	9,365	175,908
St. Louis City	12,100	384,000	820	26,895	....	....	6,500	104,720
Sullivan	10,542	286,136	1,154	28,103	88	3,504	41,570	575,128
Taney	3.013	71,919	770	18,702	46	1,220	15,523	159,343
Texas	5,904	142,582	1,715	50,346	71	2,873	18,890	211,295
Vernon	12,684	328,148	2,870	76,530	131	5,035	36,312	593,255
Warren	3,181	72,230	1,255	37,136	29	1,230	9,266	97,805
Washington	3,012	63,965	1.388	29,205	23	1,145	11,806	102,240
Wayne	3,241	86,665	1,836	58,374	38	1,910	17,414	151,156
Webster	5,524	142,850	1,818	52,192	107	3,170	12,278	145,583
Worth	6,371	165,745	470	13,920	26	1,100	19,377	328,423
Wright	4,829	117,092	1,273	37,281	69	2,534	13,928	176,212

MISSOURI LIVE STOCK.

An abstract of assessment of sheep, hogs and stock not classified as shown by the assessors' returns, June 1, 1902. (Compiled for this report by Hon. Albert O. Allen, State Auditor.)

Counties.	Sheep.		Hogs.		And all other live stock.	
	Number.	Valuation.	Number.	Valuation.	Number.	Valuation.
Total for State	906.373	$933,326	1,936,062	$4,736,918	12.924	$58,324
Adair	3,403	$4.200	10,088	$30,185	....	$1,370
Andrew	2,782	3,255	30,028	83,740	....	55
Atchison	983	1,970	41,467	113,145	303	305
Audrain	13,851	22,810	16,636	65,700	....	....
Barry	8,856	9,143	16,557	26,299	....	....
Barton	3,284	3,389	14,693	31,251	178	170
Bates	2,918	3,655	29,288	63,153	323	3,195
Benton	6,355	8,800	13,661	42,330	472	495
Bollinger	8,356	10,700	16,852	23,975	....	....
Boone	7,244	14,145	20,529	43,975	....	....
Buchanan	1,641	3,315	19,060	51,705	....	....
Butler	974	1,031	8,056	10,352	22	217
Caldwell	10,821	14,143	24,030	54,305	33	810
Callaway	15,177	25,859	15,533	45,970	....	....
Camden	8,932	18,351	8.605	22,420	281	487
Cape Girardeau	6,656	10,080	24,451	41,045	....	....
Carroll	4,237	4,423	31,829	60,703	178	926
Carter	709	1,055	3,749	7,184	42	30
Cass	4,372	6,358	30,646	78,591	....	....
Cedar	3,273	4,934	19,330	46,949	1,265	1,539
Chariton	6,741	13,124	20,380	53,442	232	466
Christian	6,050	8,024	16,604	26,404	47	286
Clark	6,135	8,575	9,715	40,320	....	....
Clay	5,470	8,145	23,284	67,580	....	....
Clinton	3,224	7,190	25,197	84,811	352	3,700
Cole	2,292	2,722	11,957	18,343	....	1,380
Cooper	6,214	11,964	27,473	76,369	....	....
Crawford	5,880	8,869	8,476	14,091	....	....
Dade	3,240	6,098	15,121	33,894	338	626
Dallas	9,889	13,911	15,444	24,146	....	....
Daviess	10,854	17,302	31,614	88,589	....	3,099
DeKalb	2,316	4,912	22,033	74,633	....	....
Dent	6,692	7,791	11,375	18,181	....	....
Douglas	11,446	17,271	11,930	22,022	248	293
Dunklin	350	410	25,073	33,430	68	2,195
Franklin	3 097	4,418	19,391	43,152	....	....
Gasconade	3,064	3,138	11.529	22,883	....	....
Gentry	7,873	11,715	25,119	73,725	56	85
Greene	5,659	6,612	22,361	34,132	2	132
Grundy	6,690	7,132	15,889	41,505	....	45
Harrison	12,343	23,226	33,174	102,886	87	781
Henry	2,134	3,180	25,784	101,605	....	....
Hickory	5,951	9,295	23,156	24,188	566	1,636
Holt	1,184	1,670	27,463	126,360	....	....
Howard	4,217	8,560	18,326	48,290	64	175
Howell	8,459	8,466	14,709	15,181	....	....
Iron	2,369	2,881	4,229	5,520	....	664
Jackson	4,215	7,860	30,338	116,046	....	....
Jasper	2,589	3,278	15,799	39,674	351	615
Jefferson	2,289	3,576	13,622	23,672	....	210
Johnson	6,295	6,295	27,724	91,135	352	230
Knox	4,658	4,814	13,464	35,018	....	....
Laclede	10,232	14,910	14,552	25,729	114	127
Lafayette	3,748	6,070	32,774	92,000	....	....
Lawrence	3,015	3,862	15,991	40,121	87	80
Lewis	8,240	8,750	12,785	49,410	23	25
Lincoln	4,536	6,570	17,642	58,350	....	....
Linn	8,499	9,232	12,728	25,747	49	2,346
Livingston	4,569	5,891	18,573	51,641	148	1,307
McDonald	4,639	4,639	13,957	16,004	137	140

MISSOURI LIVE STOCK—Continued.

Counties.	Sheep.		Hogs.		And all other live stock.	
	Number.	Valuation.	Number.	Valuation.	Number.	Valuation.
Macon	7,591	$11,290	$16,911	$41,795	....	....
Madison	3,223	3,733	8,547	12,593	73	$68
Maries	6,942	10,305	12,923	12,923	198	187
Marion	6,905	14,245	10,422	38,000	....	....
Mercer	3,207	6,436	13,863	43,585	....	420
Miller	10,390	12,655	12,651	20,975	....	110
Mississippi	91	140	14,031	22,457	7	55
Moniteau	2,552	5,120	15,140	34,330	....	....
Monroe	19,778	31,830	16,407	51,620	....	....
Montgomery	5,755	12,590	16,643	46,305	274	475
Morgan	5,896	7,196	8,317	21,651	182	185
New Madrid	393	540	11,364	13,379	....	....
Newton	602	675	10,323	27,025	225	705
Nodaway	3,187	3,523	54,651	127,679	614	600
Oregon	3,802	3,832	14,965	14,965	....	....
Osage	3,660	4,672	14,832	26,458	....	6,345
Ozark	5,990	8,804	9,453	15,928	....	....
Pemiscot	440	878	12,945	24,054	229	818
Perry	6,717	8,492	23,076	32,820	....	6,539
Pettis	4,474	7,950	21,997	63,685	15	375
Phelps	6,311	6,674	9,417	12,779	314	284
Pike	7,740	17.240	15,037	60,750	....	....
Platte	3,364	4,550	14,608	43,310	231	370
Polk	7,752	11,885	21,250	49,233	....	....
Pulaski	7,744	9,175	7,894	11,720	....	....
Putnam	7,636	9,222	11,928	20,708	205	242
Ralls	8,037	12,895	8,171	24,625	....	....
Randolph	6,373	15,270	8,878	31,380	....	....
Ray	4,326	6,952	40,442	112,583	....	....
Reynolds	4,102	4,623	9,946	17,439	1,159	823
Ripley	3,100	4,090	11,415	16,611	13	15
Saline	2,680	4,830	31,276	110,365	....	....
Schuyler	20,155	19,953	12,985	27,290	....	....
Scotland	6,398	8,680	10,855	31,175	....	....
Scott	699	821	15,872	23,105	18	18
Shannon	2,223	2,382	9,185	10,032	....	....
Shelby	10,071	16,140	13,043	39,701	....	....
Stoddard	2,809	2,811	21,616	22,063	16	21
Stone	3,196	4,909	8,545	13,868	209	416
St. Charles	3,290	6,057	22,255	67,396	....	....
St. Clair	4,833	4,850	16,863	39,370	503	510
St. Francois	1,222	1,615	3,354	6,050	....	....
Ste. Genevieve	2,682	3,315	8,990	12,048	....	....
St. Louis	603	1,300	12,324	39,490	....	....
St. Louis City	....	....	....	....	....	....
Sullivan	9,221	10,722	12,365	28,649	63	60
Taney	5,180	6,199	5,601	9,120	....	....
Texas	17,587	26,268	14,639	23,652	910	1,255
Vernon	2,491	2,879	21,059	57,290	105	426
Warren	2,199	2,520	12,611	19,335	....	5,135
Washington	2,825	3,294	7,070	9,690	51	75
Wayne	3,325	4,363	13,999	19,246	9	10
Webster	12,397	25,275	14,979	27,862	295	630
Worth	3,257	4,875	13,149	68,019	238	375
Wright	16,769	27,827	14,055	25,531	349	535

NUMBER AND ACREAGE OF FARMS AND VALUE OF SPECIFIED, CLASSES OF MISSOURI FARM PROPERTY, JUNE 1ST, 1900.

12TH UNITED STATES CENSUS.

County.	Number of farms in county.	Acres in farms.		Value of farm property.	
		Total.	Improved.	Land and improvements except bldgs.	Live Stock.
The State	284,886	33,997,873	22,900,043	$695,470,723	$160,540,004
Adair	2,696	319,132	240,892	$6,275,060	$1,685,966
Andrew	2,562	267,752	222,664	10,056,550	2,443,977
Atchison	2,149	336,591	302,117	14,095,800	3,435,939
Audrain	2,770	415,248	372,861	9,300,370	2,330,374
Barry	3,709	339,337	202,178	3,905,280	970,054
Barton	2,590	347,753	311,024	6,956,760	1,586,996
Bates	4,070	513,842	444,528	11,413,780	2,753,030
Benton	2,575	367,747	190,928	3,835,910	1,289,251
Bollinger	2,298	274,282	129,470	1,693,050	667,639
Boone	3,540	408,336	301,732	8,226,060	2,260,535
Buchanan	2,584	233,372	177,312	11,345,780	1,754,086
Butler	1,577	154,127	55,664	1,009,030	407,591
Caldwell	2,329	276,827	246,077	8,459,630	2,115,736
Callaway	3,585	483,905	340,989	7,069,828	2,278,811
Camden	2,069	284,292	82,857	1,525,800	625,402
Cape Girardeau	2,576	348,957	211,544	6,124,490	999,291
Carroll	3,692	419,245	371,073	12,130,480	2,486,775
Carter	554	64,084	22,873	388,730	187,036
Cass	3,225	411,754	363,474	11,172,190	2,441,262
Cedar	2,765	279,184	185,840	3,724,830	1,055,549
Chariton	3,805	450,367	350,567	11,016,820	2,541,637
Christian	2,648	258,208	149,140	3,060,550	782,577
Clark	2,514	307,491	224,651	7,318,290	1,555,014
Clay	2,203	235,734	197,550	8,494,180	2,085,593
Clinton	2,024	273.704	251,250	8,120,050	2,707,170
Cole	1,700	224,754	119,476	3,420,970	671,483
Cooper	2,664	338,441	264,760	9,174,080	1,903,745
Crawford	1,914	266.243	100,045	2,591,610	592,201
Dade	2,732	294,434	207,587	4,676,280	1,181,211
Dallas	2,397	257,765	125,231	1,816,980	680,318
Daviess	3,308	353,670	279,050	9,950,520	2,525,595
DeKalb	2,377	261,394	222,284	8,339,060	2,075,752
Dent	1,748	274,747	101,513	1,585,830	545,391
Douglas	2,738	348,101	126,885	1,614,540	552,530
Dunklin	2,542	143,640	101,173	2,193,520	681,774
Franklin	3,853	466,598	263,711	8,216,490	1,447,273
Gasconade	1,799	294,972	109,491	2,913,040	680,502
Gentry	2,699	300,589	227,449	8,412,970	2,362,186
Greene	4,320	369,021	278,721	8,143,910	1,537,252
Grundy	2,298	272,601	197,384	6,928,710	1,751,710
Harrison	3,836	448,941	328,598	10,878,440	3,145,983
Henry	3,447	437,720	370,976	9,309,020	2,008,658
Hickory	1,768	217,947	101,897	2,053,710	629,039
Holt	2,256	265,920	224,996	9.918,610	2,047,982
Howard	2,037	285,521	213,894	6,523,120	1,594,836
Howell	3,065	417,170	153,710	3,821,160	729,028
Iron	880	102,284	41,784	716,060	307,276
Jackson	3.681	358,904	284,122	20,806,360	2,818,278
Jasper	3,054	342,191	270,236	9,581,900	1,396,978
Jefferson	2,596	344,176	156,055	4,945,650	963,181
Johnson	3,869	488,131	411,544	10,431,130	2,367,798
Knox	2,133	309,244	252,685	6,767,650	1,868,980
Laclede	2,614	289,936	131,942	2,228,160	737,944
Lafayette	3,043	367,526	326,718	13,597,200	2,589,762
Lawrence	3,414	352.120	264,343	7,262,110	1,228,361

NUMBER AND ACREAGE OF FARMS AND VALUE OF SPECIFIED CLASS OF MISSOURI FARM PROPERTY—Continued.

Counties.	Number of farms in county.	Acres in farms.		Value of farm property.	
		Total.	Improved.	Land and improvements, except bldgs.	Live Stock
Lewis	2,277	309,821	235,437	$6,779,670	$1,511,894
Lincoln	2,763	256,643	252,984	5,936,250	1,438,071
Linn	2,925	393,454	304,720	9,297,810	2,534,203
Livingston	2,752	321,068	246,638	9,544,440	1,898,748
McDonald	2,066	186,532	87,712	1,770,370	597,275
Macon	4,233	486,180	364,444	8,990,560	2,471,227
Madison	1,163	147,711	67,225	1,152,110	385,448
Maries	1,619	248,466	92,440	1,527,450	481,426
Marion	2,022	267,621	199,145	6,175,720	1,322,291
Mercer	2,507	291,917	235,774	5,597,270	1,997,038
Miller	2,251	277,554	116,683	2,230,390	690,522
Mississippi	1,150	139,891	97,453	5,271,210	582,147
Moniteau	2,144	25,533	183,348	5,058,945	1,108,168
Monroe	3,217	405,467	331,911	8,523,970	2.514,088
Montgomery	2,264	302,932	207,008	5,134,040	1,296,986
Morgan	2,013	267,457	139,649	3,104,410	1,028,980
New Madrid	1,063	121,805	90,635	2,517,610	544,269
Newton	3,043	280,406	193,560	5,365,300	861,467
Nodaway	4,490	556,122	486,462	20,792,940	5,037,408
Oregon	1,880	224,877	86,426	1,491,630	473,671
Osage	2,022	341,103	137,186	3,550,380	728,883
Ozark	2,029	275,293	79,085	886,470	490,878
Pemiscot	1,201	85,844	47,361	1,185,130	446,610
Perry	1,936	259,259	139,945	4,022,610	651,690
Pettis	2,935	408,515	344,869	10,256,860	2,127,882
Phelps	2,013	254,286	106,241	2,016,140	573,686
Pike	2,873	397,274	294,947	8,091,890	1,891,047
Platte	2,042	261,435	182,567	9,019,870	1,710,380
Polk	3,673	360,871	234,426	4,766,860	1,350,729
Pulaski	1,512	195,117	75,660	1,338,670	480,687
Putnam	2,596	326,747	246,194	6,362,010	1,905,026
Ralls	1,996	287,995	230,319	5,856,220	1,461,202
Randolph	2,460	287,491	224,515	6,072,770	1,633,529
Ray	3,321	340,866	288,627	10,299,790	2,521,971
Reynolds	1,165	120,374	50,271	689,950	460,219
Ripley	1,740	159,723	63,496	725,380	372,258
St. Charles	2,297	300,171	220,491	8,308,590	1,107,798
St. Clair	2,851	347,511	219,404	4.495,640	1,278,211
St. Francois	1,277	207,685	97,765	2,857,400	571,629
Ste. Genevieve	1,364	230,494	94,600	2,138,160	469,070
St. Louis	4,734	264,626	206,863	31,854,400	1,527,119
Saline	3,638	438,976	384,236	15,403,040	3,140,827
Schuyler	1,654	198,530	162,867	4,222,590	1,208,585
Scotland	2,118	277,789	222,498	6,813,910	1,711,759
Scott	1,341	181,897	125,094	3,847,200	630,434
Shannon	1,311	158,024	50,665	899,890	343,645
Shelby	2,475	307,514	245,638	6,366,540	1,872,036
Stoddard	2.873	227,417	142,759	2,742,440	859,963
Stone	1,627	170,582	73,127	1,399,360	547,825
Sullivan	3,101	402,871	323,868	8,458,950	2,731,171
Taney	1,671	241,408	66,988	1,138,060	535,245
Texas	3,729	505,288	185,681	2,528,410	798,888
Vernon	3,988	484,744	408,694	9,304,010	2,098,994
Warren	1,358	217,684	116,770	3,324,140	681,068
Washington	1,724	213,130	93,743	2,124,920	608,752
Wayne	1,733	197,413	83,022	1,277,910	596,343
Webster	2,500	263,286	143,960	2,696,760	741,523
Worth	1,549	164,829	119,169	4,287,820	1,235,657
Wright	2,726	326,582	139,272	2,039,400	591,160

COAL PRODUCT OF MISSOURI.

Showing production and value by counties for the year 1902. (Compiled for this report by J. W. Marstellar, Secretary Bureau of Mines and Mining.)

County.	Product in tons.	Value.
Adair	311,563	$383,726
Audrain	33.435	52,467
Barton	200.433	238,307
Bates	359,061	381,508
Boone	23,609	36,304
Caldwell	11,853	19,902
Callaway	24,483	40,760
Carroll	1,985	3,670
Cass	1,350	3,037
Cedar	3,107	4,602
Chariton	2,025	3,592
Clay	8,052	13,688
Cole	1,045	1,829
Cooper	945	2,170
Dade	5,180	7,453
Grundy	34.936	63,232
Henry	91,616	149,718
Howard	4,350	9,050
Jackson	21.000	52,500
Johnson	8,500	16,517
Lafayette	539,612	920,479
Linn	79,221	139,440
Livingston	800	1,400
Macon	1,198,133	1,330,107
Moniteau	143	338
Monroe	1,980	3,465
Morgan	446	557
Montgomery	2,400	4.650
Nodaway	1,590	4,372
Putnam	125,543	191,854
Ralls	20,150	28,355
Randolph	450,181	526,933
Ray	280,162	450,633
Saline	205	512
St. Clair	3,139	5,663
Schuyler	3,573	4,974
Vernon	207,125	226,964
Totals	4,062,731	$5,324,828

ANNUAL REPORT OF DR. D. F. LUCKEY, STATE VETERINARIAN, FOR YEAR 1902.

Date.		How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of,
Jan.	8		1 horse	W. C. Deuser	Strattman	Chronic glanders	Quarantined
	8		10 cattle	Barney Flanagan	Clarksville	Indigestion	Died
	10	Petition	1 mule	Charles Cooper	Lee's Summit	Acute glanders	''
	13	''	2 horses	George Payne	Waddill	Chronic glanders	Quarantined
	13	''	1 horse	John Mericle	''	'' ''	''
	14		''	H. K. Smedly	Mountain Grove	'' ''	''
	14	Petition	''	J. H. Langtry	Pomona	Purpura hemorrhagia	
	18		''	A. M. Babbs	Poplar Bluff	Chronic glanders	Quarantined
	20		6 cattle	Stewart & Jack	Warrensburg	Blackleg	Dead
	24	Petition	4 horses	G. L. Ketchum	Ayres	Chronic glanders	Quarantined
	26	Letter	1 horse	J. T. Edwards	Wallace	'' ''	''
	27	Petition	1 mare	F. M. Gilpin	Adrian	Nasal gleet	Advised operation
Feb.	9	''	1 horse	F. T. Finley	Richland	Mange	Treated
	15	Telegram	4 mules	J. W. Lewellen	Vandalia	Chronic glanders	Quarantined
	22	Petition	1 horse	James Kirkpatrick	Lee's Summit	Lymphamgitis	Treated
	25	Letter	2 mules	J. W. Lewellen	Vandalia	Chronic glanders	Quarantined
Mar.	1	Telegram	55 cattle	Star Ranch & Land Co.	Neeleyville	Fluke worm disease	
	3	Petition	4 horses	Albert Cochran	Jasper	Glanders	Dead
	3		1 horse	William Seaman	Mount Vernon	Chronic glanders	Quarantined
	6	Letter	''	J. A. Thach	Aurora	'' ''	''
	10	Telephone	3 mules	J. W. Lewellen	Vandalia	'' ''	''
	17	Petition	3 cows	W. T. Huls	Wolfe	Pneumonia	
Apr.	1	Telephone	1 mule	J. W. Lewellen	Vandalia	Chronic glanders	Quarantined
	11	Telegram	1 cow	W. A. Clem	Reger	Rabies	Died
	14	Letter	1 horse	Albert M. Lehr	Marshall	Chronic glanders	Quarantined
May	10	''	1 horse	H. H. Hornberger	1918 Macklein av, St. Louis	'' ''	''
	22	Petition	40 cattle	Joseph Buechter et al	St. Elizabeth	Plant poisoning (buckeye)	
	27	''	5 cattle	W. T. Marshall	Charleston	Blackleg	Advised vaccination
June	2	''	1 horse	Edmund Johnson	Eccles	Glanders	Died
	11	Letter	''	T. P. McCormick	4554 Berlin av, St. Louis.	Chronic glanders	Quarantined
	12	Petition	2 cattle	J. A. Scammahorn	Maysville	Lumpy jaw	Advised treatment
	26	Telegram	1 cow	S. D. Brock	Macon	Plant poisoning	Treated
July	3	Letter	3 mules, 1 horse	Henry Dankleff	World's F'r G'ds St. Louis	Chronic glanders	Quarantined
	5	Petition	1 horse	Clementine Reed	Grubville	Ulcerated molar tooth	Advised extraction
	8	''	3 mules, 4 cows	Forest Harper	Carrollton	Anthrax	Dead
	13	Telephone	16 cattle	J. W. Lewellen	Vandalia	Texas fever,	Quarantined fields
	13	Persnl request	2 steers	Mont. Gordon	''	''	''
Sept.	7	Per. request	1 mule	John L. Leonard	St. Joseph	Chronic glanders	Quarantined
	29	Letter	4 horses	John Mericle	Waddill	''	''
	29	''	1 horse	Jasper Hill	''	''	''
Oct.	18	''	18 cattle	W. W. Bolton and W. J. Williamson	Jonesburg	Infested with Texas fever ticks and glanders	''
	23	''	1 mule, 1 horse	W. F. Swan	LaForge	Acute glanders	''
	27	''	2 mules	Southern Paying & Construction Co.	St. Louis	Chronic glanders	''
Nov.	1	Dr. J. Phillips.	1 horse	John J. O'Rourke	''	''	''

2	Letter	1 "	J. M. Rickman	Marquand	"	"
25	Petition	10 horses	B. W. Gorens	St. Louis	"	"
27	Letter	1 horse	W. T. Kirkpatrick	Caruthersville	"	"
27	"	"	W. J. Johnson	Cooter	"	"

REPORT OF DR. R. C. MOORE, DEPUTY VETERINARIAN, FOR YEAR 1902.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
Jan. 14	Owner	horse	J. P. Maxwell	Kansas City	Glanders	Quarantined and reported to County Court
20	"	2 horses	Sampson Sayers	Kansas City, 2004 Madison st	"	Quarantined and reported to County Court
21	"	horse	B. F. Anderson	Kansas City, 2320 Tracy ave	"	Quarantined and reported to County Court
31	Dr. W. A. Nixon	"	Harry Johnson	Kansas City, 1611 Grand ave	"	Quarantined and reported to County Court
Feb. 26	Owner	"	M. D. Payne	Kansas City, 5800 Peery ave	"	Quarantined and reported to County Court
28	"	"	L. G. Ernst	Kansas City, 3208 Thompson ave	"	Quarantined and reported to County Court
Mar. 10	"	"	B. F. Anderson	Kansas City, 2320 Tracy ave	"	Quarantined and reported to County Court
10	"	"	Geo. I. Gray	Kansas City, 2001 Walnut st	"	Quarantined and reported to County Court
Apr. 7	"	"	Isaac Pyle	Kansas City, 2622 E. 11th st	"	Quarantined and reported to County Court
10	"	"	Peter Braden	Kansas City, 2412 Mercer st	"	Quarantined and reported to County Court
12	"	"	O. N. Hunt	Kansas City, 1410 W. 13th st	"	Quarantined and reported to County Court
16	"	"	A. Knutson	Kansas City, 2247 Bellview place	"	Quarantined and reported to County Court
17	"	2 horses	Geo. Letcher	Kansas City, 2528 S. W. bvd	"	Quarantined and reported to County Court
18	"	horse	Geo. L. Hax	Kansas City, 514 E. 16th st	"	Quarantined and reported to County Court
May 5	Dr. W. A. Nixon	"	B. F. Fehlig	Kansas City, 1310 Woodland ave	"	Destroyed by consent of owner
June 4	Owner	"	Grocers Mfg. Co	Kansas City, 612 Broadway	"	Quarantined and reported to County Court
7	"	mule	H. M. Phillips	Kansas City, 2200 Vine st	"	Destroyed by consent of owner
10	"	horse	M. Bennett	Kansas City, 901 E. 9th st	"	Destroyed by consent of owner
14	"	"	F. P. Burnap	Kansas City, 706 Delaware st,	"	Quarantined and reported to County Court
14	Owner	1 horse	Adam Long	Kansas City, 1526 Central ave	"	Quarantined and reported to County Court

REPORT OF DR R. C. MOORE, DEPUTY VETERINARIAN, FOR YEAR 1902—Continued.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
June 11	Owner	1 horse	J. D. Miller	Kansas City, 2423 Mercer ave	Glanders	Quarantined and reported to County Court
24	W. G. Doak	"	H. J. Gibson	Kansas City, 1962 McGee st	"	Quarantined and reported to County Court
26	Owner	"	Wm Coats	Kansas City, 1311 Wyandotte st	"	
27	"	"	C. Lechtman	Kansas City, 1857 Benton bv'd	"	Destroyed by consent of owner
30	Dr. J. B. Black	"	Eagle Construction Co.	Kansas City, 3030 Summit st	"	Quarantined and reported to County Court
30	Owner	"	Nathan Glasen	Kansas City, 1813 McGee st	"	Destroyed by consent of owner
July 2	"	Horse	Lesser, Sholtz & Co.	1824 Grand Avenue, Kansas City	"	Destroyed by consent of owner
3	"	Mule	People's Ice & Fuel Co.	5th and Delaware, Kansas City	"	Destroyed by consent of owner
4	Dr. Brown	Mule	Flannagan Bros.	2nd and Lydia, Kansas City	"	Destroyed by consent of owner
5	" owner	Horse	Lesser, Sholtz & Co.	1824 Grand Ave., Kansas City	"	Quarantined and reported to County Court
7	Dr. Werner	3 horses	W. H. White	1609 Euclid Ave., Kansas City	"	Quarantined and reported to County Court
11	Sec. State B'd Agriculture.	1 calf	A. F. Pruess	Holden	Suspected anthrax	Burned
12	"	Cattle	H. G. Lane	Harrisonville	Blackleg	None sick; all vaccinated
14	K.C.Pol.No. 4.	1 horse	John Norton	2329 Locust St., Kansas City	Glanders	Quarantined and reported to County Court
14	Personally noticed	1 gray gelding	R. L. Hunt	5705 St. John's Ave., Kansas City	"	Quarantined and reported to County Court
16	W. S. Fletcher	1 bay gelding	E. Lumpkins	1626 Tracy Ave., Kansas City	"	Quarantined and reported to County Court
16	"	1 gray gelding	B. B. Joffee	15th and Forest Ave., Kansas City	"	Quarantined and reported to County Court
17	Owner	1 gray mule	Halliwell Cement Co.	312 E. 19th St., Kansas City	"	Destroyed with consent of owner
21		1 gray gelding			Purpura	Treated by private veterinarian
25	Dr. Carswell	1 black geld'g	J. A. Hillman	2219 Michigan Ave., Kansas City	"	Quarantined and reported to County Court
26	Owner	1 chestnut "	R. M. Moss	3120 Benton B'l'vd., Kansas City	"	Quarantined and reported to County Court
30	State Vet'n	2 horses	L. S. Adams	Pleasant Hill	Strangles, possibly complicated with glanders	Quarantined
31	Dr. A. Tricket	1 horse	Western Sash & Door Co.	23d and Grand Ave., Kansas City	Suspected glanders	Advised isolation and disinfection

Aug. 1	Owners	1 bay gelding	Wrought Iron Range Co.	1312 Main St., Kansas City	Glanders	Destroyed, consent of owner.
3	"	1 chestnut "	Wilson Bros.	19th & Main St., "	"	Destroyed with consent of owner
6	Owner	1 mule & 2 hor's	W. H. White	1609 Euclid Ave., "	"	Quarantined and reported to County Court
7	"	1 gray gelding.	O. N. Hunt	1410 W. 13th St., "	"	Quarantined and reported to County Court
8	"	1 brown mule	Keene Jackson	218 E. 3rd St., "	"	Quarantined and reported to County Court
9	"	4 horses	O. N. Hunt	140 W. 13th St., Kan. City	Glanders	Quarantined and reported to County Court
10	Dr. D. F. Lucky	Cattle	W. B. Davidson	Holden	Inflammation of skin, due to some local irritant	Advised removal to another pasture
11	Owner	1 brown mule	N. H. Comstock	2836 Tracy Ave., K. City	Glanders	Quarantined and reported to County Court
11	Dr. Carswell	1 bay mare	Henry Phillips	2031 E. 18th St., Kan. City	"	Quaratined and reported to County Court
12	State V, 2d call	2 horses	L. S. Adams	Pleasant Hill	"	Quarantined 1; destroyed 1.
13	Owner	1 horse	Flanagan Bros.	2nd & Lydia, Kansas City	Suspected glanders	Quarantined
14	"	1 bay gelding	Michael Paresi	629 Locust St., "	Chronic Glanders	Quarantined and reported to County Court
15	"	"	John Andrews	1009 E. 15th St., "	"	Quarantined and destroyed; Mallien test
16	"	1 brown geldi'g	People's Union Mer. Co.	Independence	"	Quarantined and reported to Court; Mallien test
16	"	1 brown mule.	People's Ice & Fuel Co.	Armour bl'g., Kan. City	"	Quarantined and reported to Court
16	"	1 roan gelding.	Lewis Nichols	4006 Shawnee St., "	"	Quarantined and reported to Court
17	"	30 horses	American Transfer Co.	1321 W. 18th St., "	"	Destroyed 1; quarantined 2.
18	"	1 bay mare	R. P. Reames	2109 Olive St., "	"	Quarantinea and reported to County Court
18	"	1 bay gelding	L. Gillwee	2618 Oak St., "	"	Quarantined and reported to County Court
19	"	1 gray gelding.	The Athletic Tea Co.	721 Main St., "	"	Destroyed by consent of owners
21	"	1 chestnut gl'd.	W. H. Collins	623 Independ. Ave., "	"	Quarantined and reported to Court
23	"	1 bay gelding	—— Fisher	Independence	Strangles	No action
23	Dr. Lucky	20 cattle	J. N. Marsh	Marshall	Texas Fever	Quarantined
23	"	60 "	J. F. Thorp	Napton	"	"
23	"	10 cattle	Chas Clough	Marshall, Mo.	Texas Fever	"
24	Owner	1 brown geld.	N. H. Comstock	2826 Tracy Ave., K. C.	Chronic Glanders	Quarantined and destroyed, (consent of owner)
24	"	2 horses, 1 mule	W. H. White	1609 Euclid Ave., K. C.	" "	Quarantined and reported to County Court
25	Sec'y Mo. State Board of Agr.	100 cattle	R. T. Martin	Belton, Mo.	Texas Fever	Quarantined
25	" "	2 cattle	A. J. Mangum	Belvidere, Mo.	"	"
27	Owner	1 horse, 3 mules	W. H. White	1609 Euclid Ave., K. C.	Chronic Glanders	Quarantined and reported to Court
27	"	2 horses	E. Lukens	1626 Tracy Ave., K. C.	Subacute Glanders	Quarantined and reported to Court

REPORT OF DR. R. C. MOORE, DEPUTY VETERINARIAN, FOR YEAR 1902—Continued.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
Aug. 27	Owner	1 gray mare	H. B. C. Tegler	601 E. 15th St., K. C	Chronic Glanders	Destroyed by consent of owner
27	"	Horse	J. F. Greenwood	49th and Main St., K. C.	" "	Quarantined and reported to County Court
28	"	1 brown mule	J. J. Maloney	1900 Vine St., K. C.	Glanders	Destroyed by consent of owner
28	"	1 gray gelding	Southwest News Co.	410 E. 9th St., K. C.	Chronic Glanders	Quarantined and reported to Court
28	"	1 brown geld.	People's Ice and Fuel Co.	Cor. 8th & Hickory, K. C.	" "	Quarantined, given Mallien test and reported
29	"	1 bay mule	W. A. Wise	2306 Fairmount St., K. C.	Subacute Glanders	Quarantined and reported to Court
30	"	1 bay gelding	John Andrews	208 Woodworth Av., K. C.	Chronic Glanders	Quarantined and reported to Court
Sept. 3	"	1 bay gelding	R. G. Reames	2309 Olive St., K. C.	Subacute Glanders	Quarantined and reported to Court
4	Dr. W. A. Nixon	1 bay mare	Mrs. Nellie G. Johnson	2119 Summit St., K. C.	Chronic Glanders	Quarantined and reported to Court
5	Owner	1 bay gelding	M. J. Cleveland	2727 Holly St., K. C.	" "	Quarantined and reported to Court
7	Sec'y Mo. State Board of Agr.	5 cattle	A. G. House	Belton, Mo.	Texas Fever	Quarantined
7	" "	5 cattle	J. Cohn	"	"	"
7	" "	2 cattle	W. S. Bain	"	"	"
7	" "	1 cow	F. M. Keeney	"	"	"
7	Sec'y Mo. State Board of Agr	4 cattle	C. B. Darst	"	"	"
8	Telegram	15 "	E. B. Myers	Holden, Mo.	"	"
8	"	7 "	T. H. Miller	"	"	"
8	"	3 "	Arthur Allen	"	"	"
8	"	3 "	E. Barton	"	"	"
8	"	1 cow	L. F. Murry	"	"	"
8	"	10 cattle	Mrs. Christina Struben	"	"	"
8	"	1 cow	G. R. Johnson	"	"	"
9	Dr. Nixon	1 bay gelding	James Tipton	2806 Genesee St., K. C.	Chronic glanders	Quarantined and reported to Court
9	Police Detective Kenney	1 horse	Not obtainable	Horse Market near 5th and Grand, K. C	Chronic catarrh	
10	Humane officer Gibbins	1 horse	"	Clinton & Scarrit Avenue Kansas City	Horses removed to unknown place	
10	Humane officer Greenman	Horses	"	923 State Line St., K. C	"	
11	Dr. Hadley	1 b. gelding	Rosa Schriber	1320 St. Louis Ave., K. C.	Chronic glanders	Quarantined and reported to Court
12	Dr. Getchel	1 "	C. A. Brockett	2101 McGee St., K. C.	"	Quarantined and reported to Court
15	Humane officer Gibbins	1 "	Max Studna	518 Grand Ave., K. C.	"	Quarantined and reported to Court

15	Owner	1 black geld.	August Hahn	824 E. 3rd St., K. C.	Exposed to glanders	Quarantined and reported to Court
15	"	"	"	" K. C.	Chronic glanders	Quarantined and reported to Court
16	"	2 bay geld.	Brooks Bros.	5404 St. John's Ave., K. C	"	Quarantined; given Mallien test and reported to Court.
17	"	1 bay geld.	D. W. Cull	2003 E. 27th St., K. C.	"	Quarantined and reported to Court
18	"	1 cow	E. Elkins	Belton, Mo.	Exposed to Texas fever	Quarantined and reported to Court
18	"	1 cow	Archie Sprenkles	"	" "	Quarantined
19	Humane Officer Gibbens.		August Steltz	Harlem	Chronic glanders	Quarantined and destroyed by consent of owner
19	Humane Officer Gibbins.	Several horses.	Unknown.	2010 E. 17th St., Kansas City	Horses not found	
20	2nd visit	Cattle	Several persons	Holden		
24	Dr. J. B. Black	Horse	S. Wheeler	1821 Holmes St., Kansas City	Subacute glanders	Destroyed by consent of owner
26	Owner	1 bay gelding	Joseph Cohen.	603 E. 5th st., Kansas City	Chronic glanders	Quarantined and reported to court
27	Mr. Gentry	1 bay mare	Mr. Teagarden	Independence	Chronic nasal catarrh	Not quarantined
28	Owner	1 gray gelding	Robert Keith Furniture Co.	11th and Grand ave., Kansas City	Glanders	Destroyed by consent of owner
29.	Owner.	1 black mare	F. J. Hoffman	3148 Genesee St., Kansas City	Subacute glanders	Quarantined and reported to Court
Oct. 1	Owner	1 horse	D. D. Brown	7A E. 14th St., Kansas City	Chronic glanders	Quarantined and reported to County Court
7	Dr. Hadley	"	Brooks Bros	5404 St. John Ave., Kansas City	Subacute glanders	Quarantined and reported to County Court
9		"	Lewis Adams	Greenwood	Glanders	Quarantined and reported to County Court
11	Owner	"	M. D. Payne	5805 Peery Ave., Kansas City	Catarrh of pharynx	
15	"	"	W. H. Huffer	2214 Indiana Ave., K. C.	Chronic glanders	Quarantined and reported to County Court
16	"	"	F. J. Taggart	1600 Broadway, Kansas City	Glanders	Destroyed by consent of owner
17	"	"	Bryan Lumber Co	1316 E. 15th St., Kansas City	Purpura hæmorrhagia	
17	Humane Office	"	Wm. Robinson	917 McGee St., K. C.	Chronic catarrh	
20	Owner	"	F. J. Taggart	1600 Broadway, K. C.	Chronic glanders	Quarantined and reported to County Court
21	"	"	W. H. Stark	1910 E. 17th St., Kansas City	Chronic glanders	Quarantined and reported to County Court
22	"	"	H. Huffman	1805 McGee St., Kansas City	Chronic glanders.	Quarantined and reported to County Court
22	"	"	D. Cummings	1139 Pearl St., Kansas City	Glanders	Destroyed by consent of owner
23	"	"	O. N. Hunt	1410 W. 13th St., Kansas City	"	Destroyed by consent of owner
23	"	"	Wallace Commission Co.	30th and Fairmount St., Kansas City	"	Destroyed by consent of owner

REPORT OF DR. R. C. MOORE, DEPUTY VETERINARIAN, FOR YEAR 1902—Continued.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How Disposed of.
Oct. 23	Owners	17 cattle	W. S. Bane and others	Belton	Exposed to Texas fever	Raised quarantine
23	Dr. Werner	1 horse	Ben Schwegler	2301 E. 15th St., K. C.	Chronic glanders	Destroyed by consent of owner
24	Owner	"	Scheeley Transfer Co.	817 Washington St., Kansas City	Glanders	Destroyed by consent of owner
26	Dr. Nixon	"	J. W. Barnes	1134 E. 5th St., Kansas City	Enlarged knee	
27	Police Office	"	J. L. Foley	3800 E. 16th St., K. C.	Swollen leg from wound	
28	Pers. inspec'n.	"	Horse Traders' Market		Glanders	Destroyed by consent of owner
28	Owner	"	E. McClure	2124 Washington St., Kansas City	Subacute glanders	Destroyed by consent of owner
Nov. 1	Owner	"	John Shine	2429 Charlotte St., Kansas City	Chronic glanders	Destroyed by consent of owner
1	"	"	W. B. Cubine	3039 S. W. Boulevard, Kansas City	" "	Destroyed by consent of owner
1	"	"	Con Murphy	555 Grand Ave., Kansas City	" "	Destroyed by consent of owner
3	"	"	John W. Barnes	1134 E. 5th St., Kansas City	" "	Quarantined and reported to County Court
5	Dr. Werner	1 horse	The Bear Fuel & Sup. Co.	2100 Grand Ave., Kansas City	Chronic glanders	Quarantined and reported to County Court
12	Owner	"	J. Ellis	513 Cherry St., Kansas City	Subacute glanders	Destroyed by consent of owner
15	"	"	E. McClure	2124 Washington St., Kansas City	Chronic glanders	Quarantined and reported to County Court
18	Dr. Werner	"	Claude King	504 Lydia Ave., Kansas City	Subacute glanders	Quarantined and reported to County Court
18	Owner	"	L. H. Eatherton	1711 College Ave., Kansas City	Chronic glanders	Quarantined and reported to County Court
25	"	"	P. W. Jackson	501 Bales Ave., Kansas City	"	Quarantined and reported to County Court
29	Dr. Nixon	"	D. A. White	2843 S. W. Boulevard, Kansas City	"	Quarantined and reported to County Court
Dec. 3	Dr. Black	"	A. Perky	2842 Prospect Place, W. Kansas City	"	Quarantined and reported to County Court
6	Owner	"	John Norton	2329 Locust St., Kansas City	"	Quarantined and reported to County Court
8	"	"	S. W. Young	1913 Park Ave., Kansas City	"	Quarantined and reported to County Court
10	"	"	A. V. Trott	5810 East Ninth St., Kansas City	"	Quarantined and reported to County Court
10	"	2 horses	C. A. Brockett	2101 McGee St., Kansas City	"	Quarantined and reported to County Court
11	"	1 horse	B. D. Didenour	2 Broadway, Kansas City	Glanders	Destroyed by consent of owner
15	Owners	"	National Biscuit Co.	Third and Main Sts., Kansas City	"	Destroyed by consent of owner

16	Owner	"	James McMichael	4020 Campbell St., Kansas City	"	Destroyed by consent of owner
26	Wire	8 mules (dead).	Mr. Streits	Pleasant Green	Enephelitis, from eating wormy corn	Advised change of diet

REPORT OF DR. E. BRAINERD, DEPUTY VETERINARIAN, FOR YEAR 1902.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
Jan. 3	Letter from G. B. Ellis	3 cows (1 dead)	Ira Furnish	Sublette	Indigestion	Gave treatment

REPORT OF DR. R. B. LOVE, DEPUTY VETERINARIAN, FOR YEAR 1902.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
July 10	Telegram	85 calve	R. E. Tinsley	Salem	Blackleg	Advised vaccination
24	Dr. Luckey	Cattle	Public	Quarantine line	Infected by fever ticks	
28	Telegram	9 cattle	J. M. Robinson	Niangua	Southern fever	Ticking & grazing survivors.
Aug. 16		30 calves.	A. J. Sellars	Cassville	Blackleg	Advised vaccination
22	Pers. Insp'ct'n	1 horse	W. G. Dennis	Cor. Pine and Grout St., Springfield	Chronic glanders	Quarantined
25	Telegram	1 colt	J. O. Burford	Marshfield	Ptomaine poisoning	Died.
Oct. 9	"	Cattle	E. S. Kinney	Neosho	Suspected	Passed
15	"	"	Frank Miller	"	"	"
23	"	1 mule	Jesse B. Pickell	Palmetto	Palatine abscess	Gave treatment
Dec. 2	"	10 calves	E. R. Cummins	Jolley	Malignant catarrh	
7	"	2 mares	A. A. West	Ozark	Chronic glanders	Quarantined

REPORT OF DR. LYMAN D. BROWN, DEPUTY VETERINARIAN, FOR YEAR 1902.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
Apr. 13	D. F. Luckey	Cattle	Berry Lucas	Hamilton	Anthrax	Quarantined
21	Petition	"	Samuel S. Lupold	Cosby	Actinomycosis	Recommend treatment
May 10	"	Horse	J. H. Nowell	Humphries	Nasal catarrah	" "
19	D. F. Luckey	"	"	"	" "	Extracted tooth
Sep. 9	Dr. James	Cattle	J. O. Watson	Stewartsville	Texas fever	Quarantined
20	Drs. Goode & Lomax	41 hs. and ms.	D. T. Shreve and S. M. Keiper	St. Joseph	Glanders	"
27		" "	S. M. Keiper, and D. T. Shreve	"	"	Destroyed affected ones
Oct. 6		39 " "	D. T. Shreve and S. M. Keiper	Craig	Blackleg	Advised vaccination
14	Petition	20 clvs. (4 dead)	Felix Gambrel	Corning	Impaction of stomach	Advised change of feed
24	"	Cattle	Henry Naber	Jameson	Glanders	Quarantined
Nov. 16	"	5 horses	W. L. Tilley	"	"	Destroyed
22	"	6 horses	W. L. Tilley	"	"	"

REPORT OF DR F. W. O'BRIEN, DEPUTY VETERINARIAN, FOR YEAR 1902.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
Mch. 14	Telegram	4 mules	J. W. Lewellyn	Vandalia	Chronic Glanders	Quarantined
Apr. 6	"	2 "	"	"	Farcy	"
11	Telephone	1 mare	Henry Spilter	Spalding	Glanders	"
May 5	Telegram	1 cow	George W. Smith	Monticello	Tubercular Arthritis	Advised owner to destroy
Sept. 3	"	1 steer	Tipton McClintic	Monroe City	Injured by shipping	Gave treatment
Oct. 3	"	1 mare	Frank Butts	Kahoka	Decayed tooth	Advised extraction
13	Personal insp.	"	J. F. Meyer	Hannibal	Glanders	Destroyed
13	"	"	John Mirtgua	Oakwood	"	"

REPORT OF DR. E. M. HENDY, DEPUTY VETERINARIAN, FOR YEAR 1902.

Date.	How called.	Kind of stock.	Owner.	Postoffice.	Disease.	How disposed of.
Mch. 2	Telegram	4 mules	Mr. Lewellen	Vandalia	Chronic Glanders	Condemned

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